Products finishing

HOWARD CAMPBELL, Editorial Director
FRED W. VOGEL, Managing Editor

Volume 3 APRIL, 1939 Number 7

DON G. GARDNER
President and General Manager

•

JOHN M. KRINGS
Advertising Manager

EAST
G. M. FILLMORE
JOHN VANDERVOORT
342 Madison Ave.
New York
Murray Hill 6-3899

WEST
GEORGE H. MEYERS
Tribune Tower, Chicago
Superior 8329

Member

CCA

CONTENTS

137-Year-Old Firm Sets Pace with Variety of Metal-Finishing Processes 7
By Fred W. Vogel

Plating to Specification, Part II 20
By Dr. C. B. F. Young

Barrel Finishing of Metal Products 38
By H. Leroy Beaver

Steel Surfaces Cleaned and Prepared for Painting by Means of Chemical Reaction 46
By Carleton Cleveland

Porcelain Enamel—A Lifelong Finish 48
By E. L. Stine

News of the Industry 54

New Plant Equipment and Materials 58

For Your Catalog Library 70

Index to Advertisements 72

Published monthly and copyrighted by
Gardner Publications, Inc., Business and editorial offices 431 Main St., Cincinnati, O.
More Than 14,500 Circulation This Issue

EGYPTIAN HIGH-BAKE N. F. R.

To manufacturers making hundreds of various items which require a finish, we suggest that they look into EGYPTIAN HIGH-BAKE N. F. R., the NEW type of Synthetic . . . A multi-coat finish which bakes in one operation...A finish highly resistant to chemicals . . . A finish which, when used as a complete system, contains rust inhibitive properties and many other features of interest to manufacturers now using one or another of the many types of available finishing materials.

EGYPTIAN HIGH-BAKE N. F. R. comes in a large variety of colors as well as Black, White, and Clear . . . Colors are furnished in high gloss . . . Clear may be had in high or medium gloss . . . Excellent flexibility and adhesion.

Write for further information and recommendations regarding the use of EGYPTIAN HIGH-BAKE N. F. R. for your own particular requirements.

THE EGYPTIAN LACQUER MFG. COMPANY
ROCKEFELLER CENTER, NEW YORK

PRODUCTS finishing

CINCINNATI, OHIO VOL. 3, NO. 7

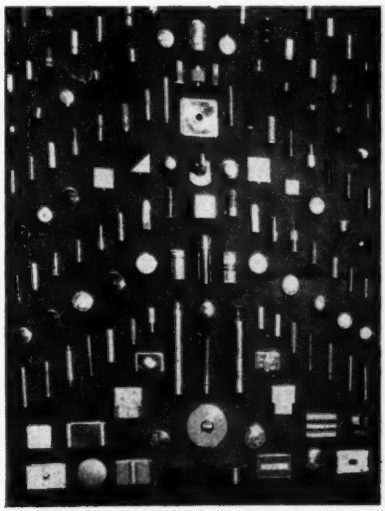
APRIL, 1939

137-Year-Old Firm Sets Pace with Variety of Metal Finishing Processes

This article tells how one of the world's largest manufacturers of metal specialties finishes a few of its one thousand and one products.

By FRED W. VOGEL

IN the heart of the Naugatuck valley, in a region often referred to as the cradle of the metal-finishing industry, is a firm of fabricators and finishers whose reputation for the marketing of high quality merchandise has spread to nearly every country on the face of the globe. More than a century and a quarter of unparalleled service has made the name of this company — Scovill of Waterbury — a symbol of excellence of craftsmanship to all those acquainted with metal specialties. One of the noteworthy features of the well-trained



Samples of the very fine fabricated and finished work produced at Scovill.

Fig. 1—A three-wheelhead buffing machine for polishing brass electric sockets.

personnel of this company has been the achievement of adapting the most modern fabrication and finishing methods available to ever-increasing production requirements.

Several of the items produced at Scovill that have been adapted to production finishing methods are vanity boxes, name plates, uniform buttons, and electrical appliance parts. The method of finishing a part such as a brass electrical socket where hand work and handling is reduced to a minimum is illustrated in Figs. 1 and 2.

When the electrical socket shells are ejected from the forming presses in the fabrication department, they are placed in tote boxes and transferred to a battery of automatic polishing machines located in the polishing and buffing department as shown in Fig. 1. The operator can be seen loading the revolving spindle-holding fixture of a three-wheel buffing unit. There are six of these finger spindles designed to accommodate the electric socket shells and when the machine is in operation the socket shells are revolved beneath the buffing wheels. Tripoli buffing rouge is used on the first wheel to cut down the surface of the brass shell. The second wheel is used to color buff and the third, used with Lea compound, produces a beautiful satin finish.

Fig. 2—A machine of unique design used for automatically spraying satin-finished brass caps with clear lacquer.

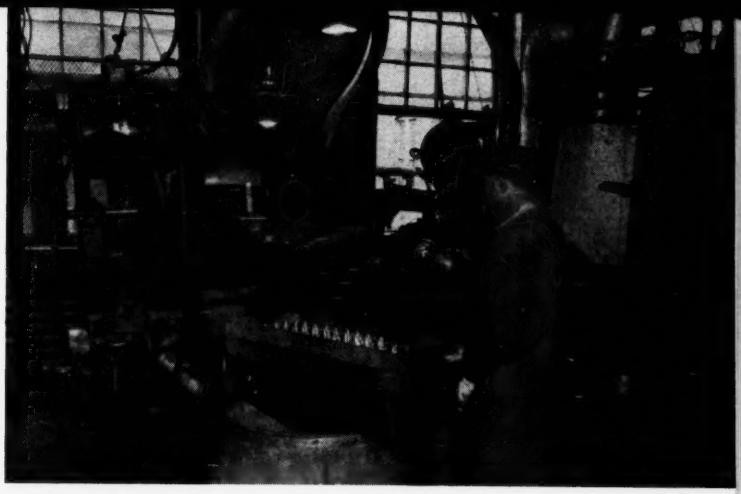


Fig. 3—A Packer five-wheelhead combination polishing and buffing machine adaptable for finishing a variety of parts.

The vertical board with pegs, shown at the right of the machine in the illustration, is part of a unique loading mechanism. After the shells pass through the buffing operation, a set of fingers located beneath the spindle is raised upward and outward by a cam action and thus pushes the socket onto one of the pegs of the board. At each indexing of the loaded spindles, the pegged board is automatically moved over one space to receive the next socket. Each board is designed to receive 48 sockets. Four boards filled with the satin-finished sockets can be seen at the left of illustration Fig. 1. The sockets are arranged on the boards in the

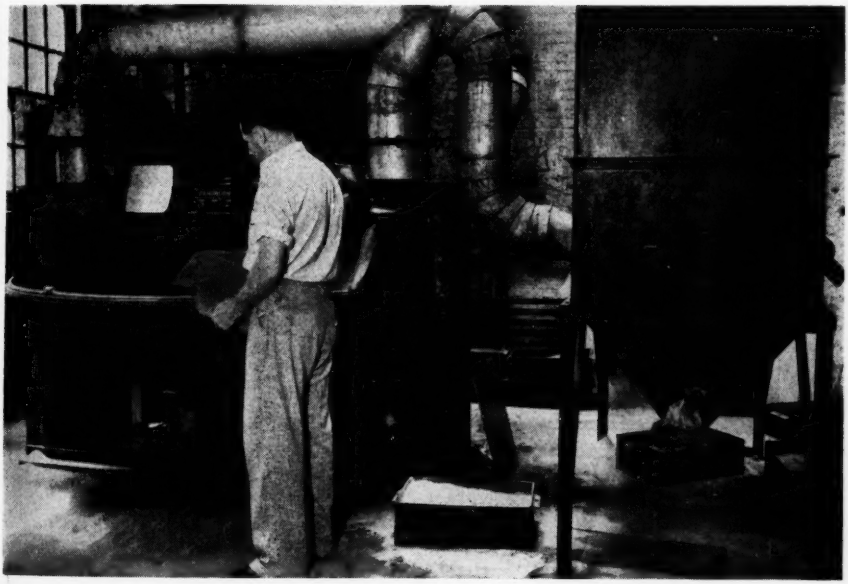


Fig. 4—The Pangborn sand blast machine shown here is used to clean stamped steel parts and castings.

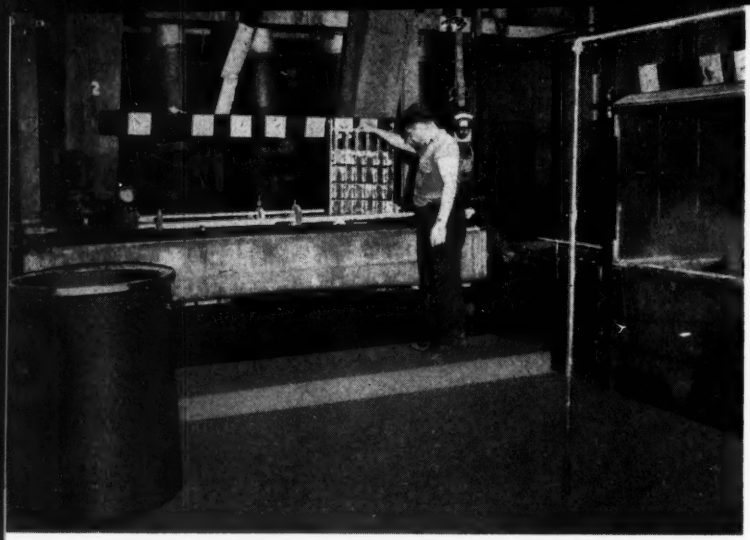


Fig. 5 — Illustration showing a view of the Anodizing department where aluminum work is finished in colors of rainbow hues.

manner just described to facilitate handling and transfer to an automatic conveyor which carries them to a lacquer finishing machine where a clear lacquer is sprayed over the buffed socket to aid in preserving the beautiful satin finish.

Figure 2 shows a view of the lacquer spraying operation which is performed automatically. The machine shown here is capable of finishing sockets and socket caps at the rate of 48 pieces per minute. Small socket caps that have been satin finished are placed on the long finger-like spindles by the operator. The spindles of this finishing unit begin to revolve as soon as they are indexed around to the spraying area, which in the case of this particular unit is approximately one-half the length of the exhaust opening, as shown. When the revolving spindle and cap reach the spray area, clear lacquer is automatically discharged from a spray nozzle located opposite the exhaust opening, the spray being automatically shut off as the work is indexed out of the spray area.

After receiving the coating, the spindles on which the lacquer-coated caps are fastened are automatically indexed downward until they reach a vertical position. As each spindle reaches this point, the cap falls by gravity onto a spike on a 40-foot conveying chain, a portion of which can be seen in the lower foreground of Fig. 2. This chain passes through a steam-heated chamber maintained at a temperature of 400 deg. and carries the lacquered caps through to be dried. Located at the opposite end of the heated chamber is the unloading and inspection station where the finished caps are removed from the spike conveyor chain and placed in boxes ready for the assembling department.

Lawn sprinkling accessories form an important group of products that are manufactured and finished in this plant. The final finishing operation on a major portion of work of this type consists of polishing and buffing the bare metal, but there is still a vast quantity of work that requires plating. The polishing and buffing of a small brass forged nozzle prior to chrome plating is shown in Fig. 3. This illustration shows a Packer five-wheelhead unit which is equipped with 12 revolving horizontal chucks. The brass nozzles are located on the ends of the spindles by the operator and then the entire fixture which holds the spindles, together with the driving mechanism, is indexed

IF the finish were really the end

If the finish really finished the job — but it doesn't! The coating you apply plays a big part in the sale of your product — and it has to stay with your product for a long, long time to be sure that the buyer remains a satisfied customer. No, the finish is definitely NOT the end — but a Stanley Finish will very probably mark the end of your finishing problems. Write Department D.

THE STANLEY CHEMICAL CO.
East Berlin, Conn.
Lacquers Synthetics Enamels Japans
A Subsidiary of THE STANLEY WORKS New Britain, Conn.

around, carrying the workpieces into position beneath the wheels.

The first wheel of this five-head machine is set up with No. 180 emery. Upon leaving the first wheel, the workpieces pass three buffing wheels on which Tripoli cutting rouge is used. The fifth and final buffing wheel, on which a lime rouge compound has been applied, is used for coloring. Maximum buffing efficiency at high speeds on automatic units of the type described here is obtained through the use of Jackson Airway Ventilated Buffs.

Another of the interesting production finishing operations is shown in illustration Fig. 4. The operator shown here is loading and unloading a Pangborn blast cleaning unit with work that consists of steel stampings and castings. The workpieces to be cleaned are placed on the 8-foot horizontal table of the unit, which revolves in a circular motion and thus carries the work into the machine. At the same time, compressed air inside the unit is used to direct sand under high pressure against the workpieces.

The sand strikes every surface of the work as it passes through the machine. One complete revolution of the table, or, in other words, the time required for the work to be thoroughly cleaned, is approximately four and one-half minutes.

The rectangular-shaped box shown at the left of Fig. 4 is the dust collecting chamber used in connection with the sand blasting unit. After the sand has been directed against the work, it is drawn over into the collecting unit by means of vacuum where it remains until it is transferred back again to the main hopper of the blasting unit. On some work, where a sand blast or satin finish is desired, a coating of clear lacquer is applied over the work.

Anodizing of aluminum fabricated work such as vanity boxes, license plates, lipstick cases, razor boxes, and evaporating doors for electric refrigerators is another example of the variety of finishes that are applied at the Scovill plant. Fig. 5 shows one section of the Anodizing department. The Anodized finish is available in a variety of colors, depending upon the color of dye used and is obtained by immersing aluminum workpieces into a specially prepared solution and reversing the direction of current. The work comes to the Anodizing department after it has been prepared by buffing on a 10-inch soft wheel, using a silicate composition and operating at a speed of 3,600 r.p.m.

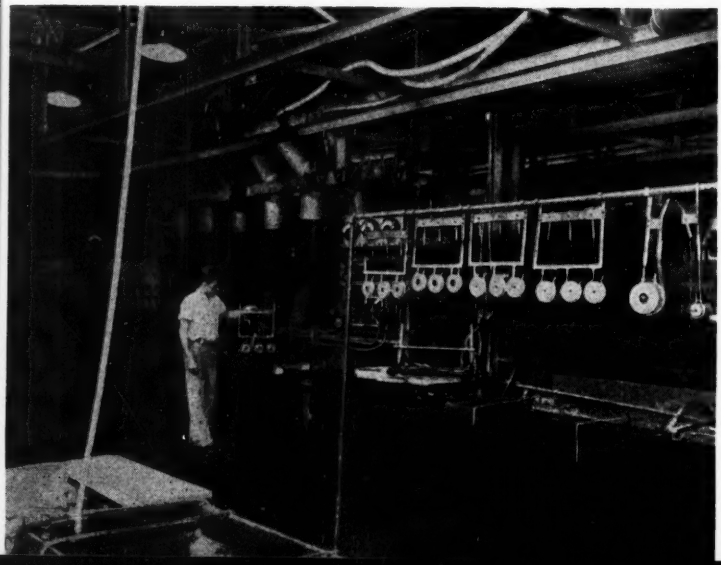


Fig. 6 — Hard chromium plating department where dies and tools are plated with wear-resisting chromium.

The Weather Stays OUT!

. . . In The Stratosphere

Climbing miles into the Arctic cold of the stratosphere! Yet the pilot is safe and comfortable — *sealed* in his protective covering. . .

And During Shipment

Where the elements are *dangerous,* they must be shut out! That's why all AP Abrasives are delivered *sealed* in the sturdy, protecting "Masterpak"!

Impervious to moisture and dirt, armored against hard knocks, "Masterpak" delivers its contents to you factory-fresh, crisp and clean — without torn edges, damaged corners, or limpness caused by moisture.

Add to "Masterpak" such AP advantages as those listed at the left, and you'll understand why thousands of users are finding it *profitable* to specify "AP". If you're still a skeptic, ask your jobber about AP's Free Trial Offer that lets you see for yourself — without obligation. Abrasive Products, Inc., 509 Pearl Street, South Braintree, Massachusetts.

Specify "AP" For These Advantages: **"MASTERPAK" Containers • 48-Hour Action On ALL Orders • Authoritative Technical Counsel • Complete Line—Over 2,000 Items.**

ABRASIVE PRODUCTS INC.

JEWELOX • JEWEL EMERY • JEWEL GARNET • JEWELITE • JEWEL FLINT • NEW PROCESS

In order to insure a perfectly clean surface at the outset of the Anodizing process, the workpieces are cleaned in an alkaline cleaner consisting of Metex compound. This alkaline cleaning solution is maintained at a temperature of 110 deg. and has a capacity of 500 gallons. The temperature of the solution is automatically controlled to within 70 to 80 deg. F., refrigeration coils being provided around the tank to keep the temperature between 70 and 80 during warm weather. The solution in the tank is constantly agitated. Work remains in the tank from 10 to 35 minutes with a current strength of 15 to 35 amperes per square foot. The Anodizing tank is equipped with solution surface ventilating ducts which remove the fumes at their point of origin and thus keep the room air clean and free from fumes.

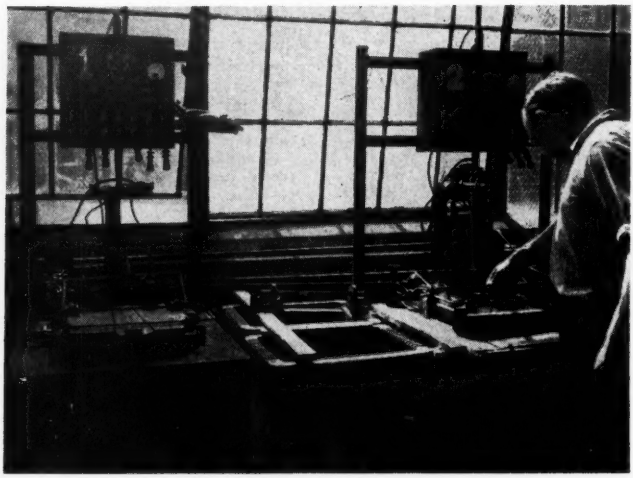


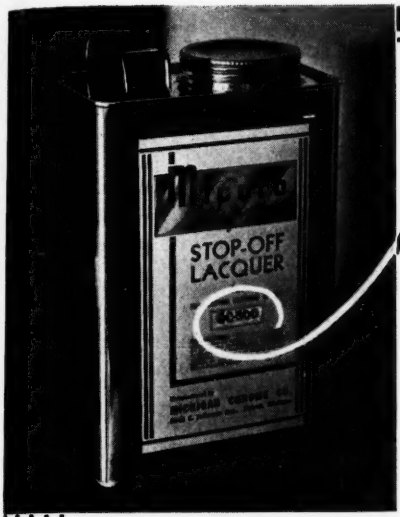
Fig. 7—The operator shown here is removing a barrel of silver-plated work from the silver solution tank.

The Anodizing solution itself does not color the work, but leaves the aluminum pieces with a satin-like finish. To color the Anodized work, the pieces are first cold water rinsed and then placed in one of the dye solution tanks containing dye of the color desired. These tanks are made of Monel metal and the dyes, which are of a variety of colors, are specially prepared from organic materials. The temperatures of the dye solutions range from room temperature up to 140 deg. F. and the time required for the dyeing process is 5 to 10 minutes, depending upon the shade of the color desired.

To preserve the beautiful color that is obtained by dyeing the Anodized work, a sealer is used, consisting of a nickel acetate solution. The solution, which is said to prevent the dye from

by means of a steam coil located inside the tank. The tank has a capacity of 300 gallons. The next step is to "etch" the work in a strong sodium hydroxide solution. The solution is contained in an Armco iron tank and is also heated with a steam coil located inside the tank. Following the sodium hydroxide dip, a continuous flowing cold water rinse tank is used for rinsing the work. A nitric acid pickle follows. The nitric acid pickle is kept clean and free from contamination in the U. S. stoneware crock shown at the left foreground of illustration Fig. 5. A cold water rinse is next used, and with this step, the preliminary operations prior to Anodizing are completed.

The Anodizing tank is lead lined



A NEW NUMBER *That Designates* A NEW *Clear* STOP-OFF-LACQUER

•To meet the demands of those concerns that prefer to use a clear, non-pigmented lacquer for insulating plating racks, the Michigan Chrome Company now offers such a protective coating.

•In every way this new, clear Miccro-Supreme Stop-Off Lacquer is comparable to the red and black lacquers which have had such a remarkable acceptance throughout the country. It is strictly compatible with these lacquers. It provides exceptional insulating service at lower cost per rack than any other type of rack coating. It can be applied DIRECTLY ON THE METAL SURFACE with no treatment necessary other than a thorough cleaning of the surface to be coated. It is quickly applied, drying with a perfectly uniform coating which will withstand many of the most severe tests to which plating racks may be subjected.

Miccro Supreme

STOP - OFF LACQUERS

Developed and Manufactured By Experienced Platers

• Be sure to have full information on this new, clear lacquer, as well as the other Miccro-Supreme Stop-Off Lacquers used for insulating plating racks and masking parts for hard chromium plating. Your inquiry will receive our immediate attention.

MICHIGAN CHROME COMPANY

6342 East Jefferson Avenue • Detroit, Michigan

leaching, is kept in a Monel metal tank at a temperature of 180 deg. to 200 deg. F. Following the application of nickel acetate, the work is dried in an oven which is maintained at a temperature of 180 deg. F. Next is a color buffing operation in which a soft wheel and a fine lime composition is used.

Drawing dies that are used in the forming operations of many brass parts are hard chromium plated for wear resistance. Three chromium plating tanks of 300 gallons capacity each are located in the hard chromium plating department, a view of which is shown in Fig. 6. The inside surface of the drawing dies shown suspended from the racks in the illustration will be plated with 0.003 inch of chromium. The amount of current required varies between 3 and 5 amperes per square inch and the length of time the parts are in the solution is three hours.

Before chromium plating, the dies are placed on racks especially designed to provide maximum throwing power. The pieces are then subjected to an alkaline cleaning solution for approximately 10 minutes. A cold water rinse follows, and the parts are then pickled in a 50 per cent sulphuric acid solution for 5 minutes with reversed current. A blast of hot air is used to dry the parts following the sulphuric acid pickle. The portions of the workpieces which must remain unplated are coated with a chromium stop-off lacquer. After the stop-off lacquer is applied, the parts are placed in the chromium plating solution. Upon removing from the plating tank, the parts are subjected to a cold water rinse. A Weston ammeter is employed in keeping an accurate check of the amount of current going into the solution at all times. A Foxboro recorder automatically provides an accurate means of checking the temperature of the plating solution.

Uniform buttons are plated with gold in the plating barrel shown at the left in illustration Fig. 7, an identical barrel, shown at the right, being used for silver plating. The barrels are 10 in. x 7 in. and the crocks in which they are located are 12 in. square. The capacity of the barrels is approximately 600 pieces of ½-in. to ⅝-in. diameter buttons. Each barrel is geared to a separate driving mechanism that revolves the barrels at the rate of 4 r.p.m.

Each load of work to be gold plated is carefully weighed before and after

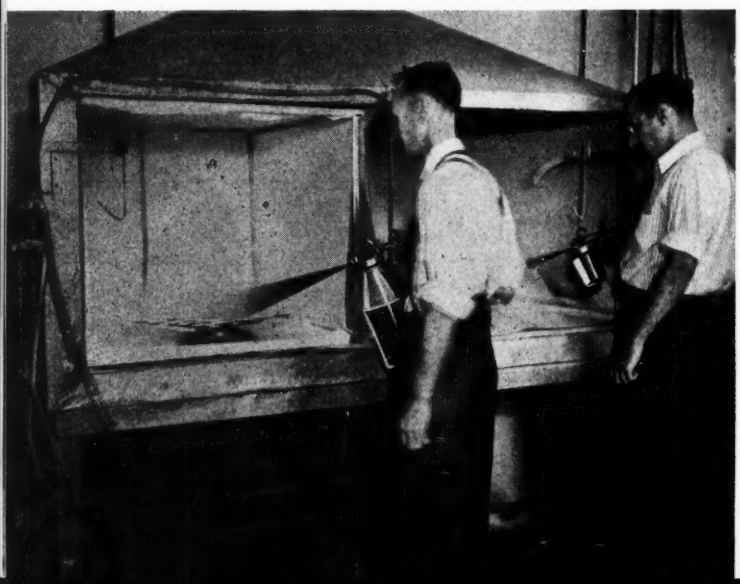


Fig. 8 — Lacquer is sprayed on metal surfaces before flock is applied. The man at the right is operating a lacquer spray gun and the other is operating a flock gun.

A NEW BOOK
BONDERIZING PROTECTS
METAL SURF
A BETTER FI
BOND ERIZING
A PARKER PROCESS THAT HOLDS PAINT TO STEEL AND RESISTS RUST
DESCRIBING BONDERIZING AND ITS LATEST DEVELOPMENTS

Every year sees new advances in scientific methods of rust control. This new book outlines the most recent developments in a modern process for finish betterment. It describes the latest improvements, that result in greater efficiency, lowered installation and operating costs, and methods of application that widen its scope of usefulness to include hot or cold rolled steel, as well as zinc coated or die-cast surfaces.

This book indicates the hundreds of products to which Bonderizing is applied and lists some of the world known corporations that use it as a necessary step in their finishing systems.

Every factory executive or technical man responsible for metal finishing should have a copy. If you have not investigated Bonderizing recently, send for your copy.

PARKER RUST PROOF COMPANY
2172 E. Milwaukee Ave. • Detroit, Mich.

PARKER *Processes* **CONQUER RUST**
BONDERIZING - PARKERIZING

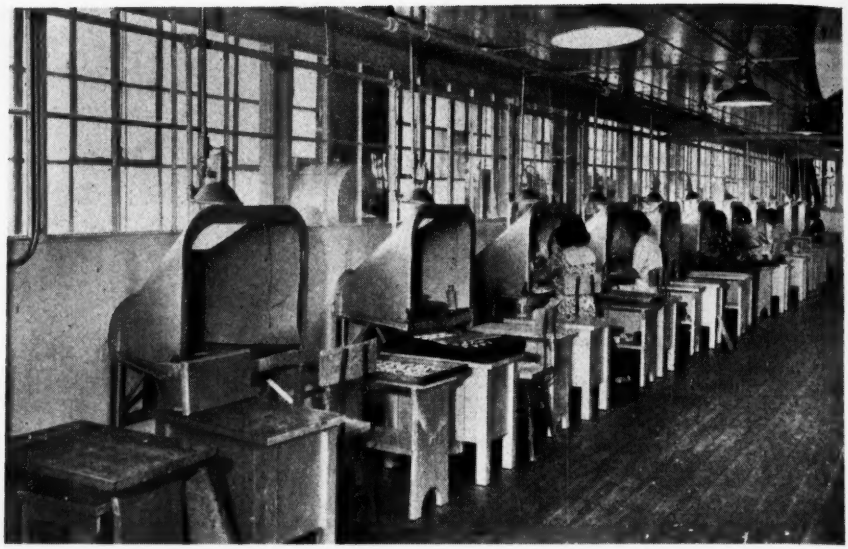


Fig. 9—An interior view of the glass-enclosed, fully air conditioned enamel spraying department.

plating to provide a check on the amount of metal deposited. After gold or silver plating, the buttons are rinsed and burnished with a hand burnishing tool in order to obtain a high-lighting effect that adds to the appearance.

Parts of products such as powder lids of vanity cases are sprayed with flock—a material made of shredded rayon, wool or cotton—to form a hermetic seal for purposes of sanitation. The backs of memo pads are also sprayed to provide a soft pad so that the memo will not mar any object on which it may be placed. Illustration Fig. 8 shows a view of the flock-spraying booth.

The operator at the right sprays a coating of enamel onto a tray of work, the enamel being the same color as the flock that is to be applied, and before the enamel dries, transfers the tray to the booth located at the left. The second operator is shown spraying the work with white flock. The gun is a Binks unit that has a capacity of one pound of the flock material.

The inside of the flock spray booth is lined with cheesecloth so that the sprayed flock does not go out through the exhaust system but remains in the booth and thus can be reclaimed for further use.

A view of a completely air conditioned spraying department where items such as lipstick holders, vanity cases, and so on are sprayed with enamel is shown in Fig. 9. Every precaution was taken in the design and construction of this department to reduce the presence of dust to a minimum. The 12 spray booths located in this department are scientifically designed to afford maximum spraying efficiency. Six exhaust fans are employed to remove the excess spray and fumes from the booths; thus each fan accommodates two spray booths. Individual explosion-proof General Electric vapor lamps

are located directly above each booth and provide illumination through a section of ground glass in the top of the booth. An automatic sprinkler system located directly over the line of spray booths reduces the possibility of fire hazard.

The air inside the spraying department is passed through a double set of filters before coming into the department and is maintained at a temperature of 72 to 75 deg. at all times. Each booth is supplied with an adjustable turntable on which work to be sprayed can be mounted in a position most convenient to the spray operator. The spray guns used to apply the various colors of enamel are products of the Binks Manufacturing Company.

Manual on Water Analysis. Men engaged in analytical work on water conditioning in their plants will find a wealth of valuable information in the new, enlarged fourth edition of the Water Analysis Manual, recently published by the Betz Laboratories.

This handbook contains complete, up-to-the-minute facts on water analysis by outstanding authorities and tells how to obtain representative samples and follows through with correct procedure and calculation of results for each test. The chemicals required are also enumerated and apparatus is illustrated. In addition to various standard tests, several new methods of analyses are described, including the T H Q and Betz-Hellige methods for sulfate determination.

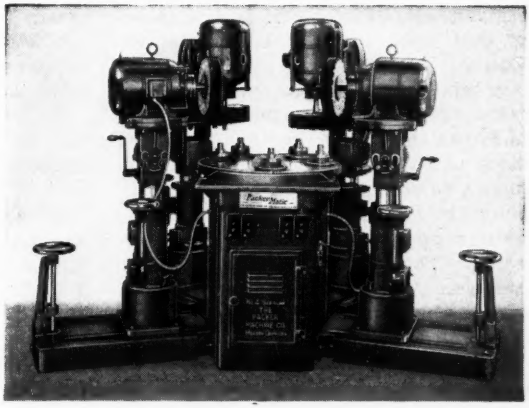
The Betz Water Analysis Manual has been adopted by many concerns as a standard reference book. Enlarged, well illustrated, containing 20 pages and over 10,000 words, this new edition will be mailed without cost or obligation if request is made on company letterhead to W. H. & L. D. Betz, chemical engineers and consultants on all water problems, 235 W. Wyoming Ave., Philadelphia, Pennsylvania.

Mention PRODUCTS FINISHING when writing to advertisers. Your co-operation will be appreciated both by the advertiser and this magazine.

Packer-Matic
Automatic
POLISHING & BUFFING MACHINES

Progressive Manufacturers alert to the many advantages and cost saving value of Automatic Polishing and Buffing look to PACKER-MATIC to cut hourly costs and increase their production. The PACKER - MATIC shown is the New No. 4 Rotary-5 Station Machine — also made in Straight Line Conveyor, Double Row and Vertical Portable Types.

Actual "Time Study" on Your Product gladly made without obligation. SEND Sample and Finish desired.



THE PACKER MACHINE CO.
MERIDEN, CONN.

Plating to Specification Part II

By Dr. C. B. F. Young

Head of Institute of Electrochemistry and Metallurgy; Consultant

In an earlier paper (*) the specifications for plating zinc, cadmium, chromium, nickel, and copper on steel, as suggested by a joint committee composed of members of the various technical societies and the Bureau of Standards, was given. Also in this paper was presented a method of calculating the time required to deposit a predetermined amount of metal. A set of tables based on this method were compiled for ten metals which contained the time necessary to give a definite thickness of deposit at a given number of current densities. Since writing the first article, the author has been asked why gold was not included in the tables. For this reason, data concerning this element has been worked out and is presented herewith. The method used in calculating the period required to deposit a given weight of metal is the same as that used to calculate the other tables.

A table has also been calculated for brass. This has not been done before as far as the author knows. However, there is no reason that such a table cannot be compiled if certain assumptions are made. As a good example, a 70 copper, 30 zinc alloy was selected. The electrochemical equivalent was calculated by taking 70 per cent of the electrochemical equivalent of copper and adding it to 30 per cent of the electrochemical equivalent of zinc. This gave 0.0005629 grams per coulomb as the electrochemical equivalent of brass. The density was calculated in the same manner, which gave 8.5. The table for brass was then calculated in the same manner as the others. This table, at least, will serve as a guide in plating brass to specification.

At this point it might be well to go into the fundamentals of specification plating. In order for a thorough job to be done in this field, there are three requisites which must be met. These are:

(A) The amount of metal which must be deposited and the theoretical time required at a given current density.

(B) The actual time which is necessary to accomplish (A).

(C) Methods of checking the plate to ascertain if the desired amount of metal has been deposited.

By referring back to the tables it will be seen that (A) has been answered. Thus, we are ready to discuss (B) of the above outline.

In almost every case it will be found that the time required to produce a given deposit will be greater than the theoretical period indicated by the tables. The reason for this will become apparent from the discussion below. The amount of metal deposited is dependent upon three fac-

(*) Products Finishing, Vol. 3, No. 1, Oct., 1938, pp. 47-56.

tors. These were discovered years ago by the brilliant English scientist, Michael Faraday (1791-1867). Faraday observed that if he passed, for example, one ampere for one hour through a copper sulfate solution, a definite amount of copper was deposited. If two amperes were passed through this solution for one hour, twice as much copper was deposited. Faraday also observed that if a copper strip was used as the anode, it lost the same amount of copper as was gained by the cathode. By noting these and many other similar experiments, Faraday was able to express this as a theory which later became "Faraday's First Law." It may be stated thus: The quantity of metal dissolved at the anode or deposited at the cathode is dependent upon the time a given current flows.

It will be noted that the above law considers only one metal. The relative amounts of different metals are not taken into consideration. Faraday studied this situation also. He found that a definite current flowing for a given time would deposit the metals in equivalent quantities. This is known as the second law of Faraday and may be stated as follows: The amounts of different metals dissolved at the anode or deposited at the cathode by the same quantity of electricity are proportional to their equivalent weights.

From the first law it can be seen that a definite amount of current is always needed to deposit an equivalent weight of an element. In order to deposit an equivalent weight of silver it must be remembered that one ampere will deposit 1.1180 milligrams of silver in one second. Thus, the atomic weight equals the equivalent weight equals $107.88. \frac{107.88}{0.0018} = 96,493.7$ coulombs, or roughly, 96,500 coulombs of electricity will deposit one equivalent weight of silver or *any other metal.* This amount of current is known as a Faraday and is also equal to 26.805 ampere hours. Thus, a Faraday will deposit an equivalent of copper, iron, tin, chromium, and so on. It must be remembered that the

Element	Symbol	Atomic Weight	Val. or Cg.Val.	Mg. per Coulomb	Coulomb per Mg	Grams per Amp. Hr.	Amp. Hr. per Gram	Lb./1000 Amp. Hr.	Amp. Hr. per Lb.
Cadmium	Cd	112.41	2	0.58244	0.71693	2.09677	0.47692	4.62258	216.329
Chromium	Cr	52.01	6	0.08983	10.13247	0.32338	3.09235	0.71293	1402.668
			3	0.17965	5.56624	0.64676	1.54618	1.42585	701.334
Cobalt	Co	58.84	2	0.30539	3.27452	0.90966	1.00966	2.42356	412.617
Copper	Cu	63.57	2	0.32983	3.03602	1.18576	0.84334	2.61416	382.532
			1	0.65876	1.51801	2.37152	0.42167	5.22831	191.266
Gold	Au	197.2	3	0.68117	1.46805	2.45223	0.40779	5.40627	184.792
			1	2.04352	0.48935	7.35668	0.13593	16.21871	61.657
Hydrogen	H	1.0078	1	0.010444	95.75313	0.037597	26.59809	0.082886	12064.693
Iron	Fe	55.84	2	0.28933	3.45630	1.04158	0.96008	2.29628	435.487
Lead	Pb	207.21	2	1.07363	0.93142	3.86506	0.25873	8.52099	117.357
Nickel	Ni	58.69	2	0.30409	3.28846	1.09474	0.91346	2.41348	414.340
Oxygen	O	16.0000	2	0.082902	12.06250	0.29845	3.35069	0.65796	1519.850
Platinum	Pt	195.23	2	1.01155	0.98858	3.64160	0.27460	8.02834	124.559
Rhodium	Rh	102.91	3	0.35547	2.81314	1.27971	0.78143	2.82128	354.449
Silver	Ag	107.880	1	1.11793	0.89451	4.02454	0.24848	8.87259	112.707
Tin	Sn	118.70	2	0.61503	1.62595	2.21409	0.45165	4.88124	204.866
Zinc	Zn	65.38	2	0.33876	2.95197	1.21952	0.81999	2.68859	371.942

Fig. 1—Table of the electrochemical equivalents for the most important metals.

equivalent weight is the atomic weight of a material divided by its valence. A table of the electrochemical equivalents for the important metals is listed in table Fig. 1.

Both of Faraday's Laws may be written as follows:

W=CTZ

When W=Weight of metal dissolved or deposited
C=Current which flows
Z=Electrochemical equivalent

Thus. theoretically, the weight of a metal dissolved at the anode or deposited at the cathode depends upon three factors. However, it must be pointed out that both Faraday's laws make the assumption that all current flowing through a bath is used to deposit one and only one material. In practice, this is not true because the current has a tendency to decompose the water which is used as a solvent, liberating H_2 at the cathode and 0_2 at the anode. The current so used does not deposit metal at the cathode. Thus, a thief is present. The same is true for any impurity in solution which is reduced at the anode or oxidized at the cathode. Therefore, one can now see just why the actual time required to deposit a metal is higher than the theoretical. It is essential for the electroplater to know this difference and to take it into account. Just how great is this loss is a question which is well worth answering when calculating the plating time. This will depend upon many factors and is summed up in the phrase "current efficiency."

Amperes per sq. ft.	Voltage at 67 deg. F.	Voltage at 120 deg. F.
4.0	4.0	1.5
4.5	4.5	2.0
7.0	6.0	3.3
12.0	10.0	6.5
17.0	13.5	8.6
22.0	14.0	10.5

Distance between electrodes—3 inches
Anode area—4 square inches
Cathode area—4 square inches

Fig. 2—Data recorded to illustrate that there is no direct relationship between voltage and current of the bath of a cuprous cyanide solution.

Take, for example, the plating of cadmium. If all the current which passes through a bath is used to dissolve this metal at the anode and deposit it at the cathode, the current efficiency would be perfect, or 100 per cent. That is to say, the anode and cathode efficiency would each equal 100 per cent. In order to obtain this condition all the metal calculated by Faraday's laws must be deposited. From this last statement it can be seen that current efficiency is the ratio between the amount of metal dissolved at the anode or deposited at the cathode and the amount of metal which should be, theoretically, dissolved or deposited according to Faraday's law. This may be stated as shown below:

$$\%\ \text{Anode efficiency} = \frac{\text{Amt. metal actually dissolved}}{\text{Amt. metal dissolved according to Faraday's laws}} \times 100.$$

% Anode Effcy.	% Cthde Effcy.	Change in conc. of metallic ion being plated	pH	H^2 evolved	O^2 evolved
100	100	No change	Decreases	None	None
80	80	No change	Increases	20%	20%
90	80	Increases	No change	10%	20%
80	90	Decreases	No change	20%	10%

Fig. 3—Table showing results of anode and cathode efficiency tests.

THE ANODEX PROCESS

Cuts Your Cleaning Cycle In Half

The Newest, Quickest Metal Cleaning Method

It takes only 30 seconds to 3 minutes—with the NEW ANODEX PROCESS—to clean steel and copper-plated parts prior to plating or finishing. And better yet, this high speed process eliminates several operations now necessary in other cleaning systems—hand scouring, hand wiping, sawdust, wet and ball rolling, safety solvents. It requires no new equipment.

ANODEX goes still farther—it effects a more uniform, bright deposit that will adhere longer to the base metal—prepares the way for a heavier, brilliant deposit in recessed parts.

Start your profits in the cleaning department *now* with the high speed, low cost ANODEX PROCESS.

Write for details

No Royalties • No License Necessary

MACDERMID INCORPORATED

Waterbury • Connecticut

METAL METEX CLEANERS

$$\% \text{ Cathode efficiency} = \frac{\text{Amt. metal actually deposited}}{\text{Amt. metal deposited according to Faraday's laws}} \times 100.$$

The above equations give the per cent efficiency of each electrode. These figures, taken from 100 per cent, represent the amount of current which is wasted as far as the metal in question is concerned. In order to illustrate the above take the following problem:

Current used to deposit copper, 10 amp.
Time, 1 hour
Z for copper (Cu+) = 2.3715 grams/amp. hr.
Amount of copper deposited = 13.9845 grams

$W = C\ T\ Z$

$W = 10 \times 1 \times 2.3715 = 23.715$ grams

$$\text{Cathode efficiency} = \frac{13.9845}{23.715} \times 100 = 58.8\%$$

Thus it will be seen that 58.8 per cent of the current is used to deposit copper, while $100 - 58.8 = 42.2$ per cent is used to deposit H_2 or some other material. Therefore, it is essential to increase the plating time, which is based upon 100 per cent efficiency, by 41.2 per cent. If the plating time was found to be 1 hour 20 minutes by using the tables given in the first article this must be increased by 41.2 per cent or 33 minutes. Thus, the correct time would be 1 hour 55 minutes. One can readily see the importance of current efficiency in specification plating.

At this point, it is well to point out the fallacy of trying to plate to specification using the voltage as the indicator. It is impossible to tell how much metal will be deposited at a given voltage. Thus, when one says, for example, that a plate was obtained at three volts for one hour, the amount of metal deposited is unknown. Faraday's laws do not mention this factor. The only way that voltage can be made to indicate the amount of metal deposited is to give

GOLD AU+

Electrochemical equivalent = .0020436
Density = 19.32
Weight = $0.00254 \times 6.4432 \times 144 \times 19.32 = 45.51$ grams

$$\frac{45.51}{1 \times .0020436} = 22{,}221 \text{ sec.} = 370 \text{ min.} = 6.20 \text{ hours}$$

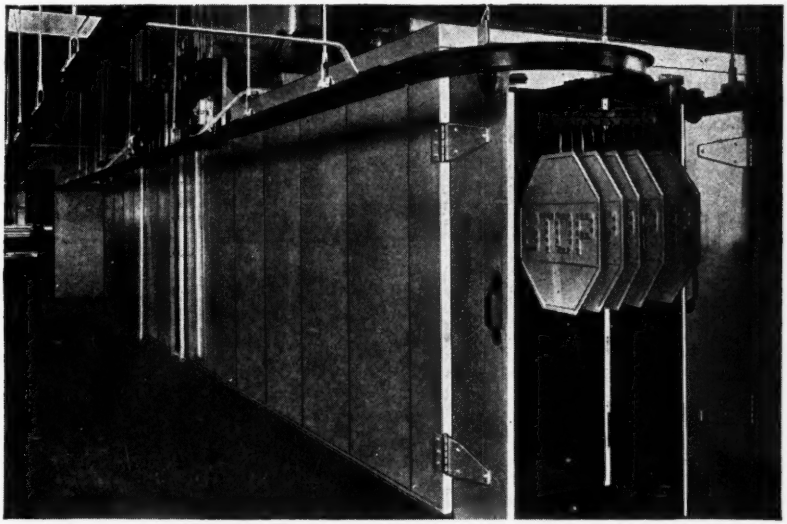
C. D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	.002	.003
1	37	1-14	1-51	2-28	3-5	3-42	4-19	4-56	5-32	6-10	12-20	18-30
5	7	15	22	30	37	44	52	59	1-7	1-14	2-28	3-42
10	4	7	11	15	18	22*	26	30	33	37	1-14	1-51
15	2	5	7	10	12	15	17	20	22	25	50	1-14
20	2	4	6	7	9	11	13	15	17	19	37	56
25	1	3	4	6	7	9	10	12	13	14	30	44
30	1	2	4	5	6	7	9	10	11	12	24	36
35	1	2	3	4	5	6	7	8	9	11	22	33
40	1	2	3	4	5	6	6	7	8	9	18	27
45	0.8	2	2	4	4	5	6	6	7	8	16	25
50	0.7	1	2	3	4	4	5	6	7	7	15	22
g/sq. ft.	4.55	9.12	13.62	18.20	22.70	27.22	31.80	36.40	41.00	45.51	91.02	136.53
Avoir. oz./sq. ft.	0.16	0.32	0.48	0.64	0.80	0.96	1.12	1.28	1.44	1.60	3.20	4.80
Troy oz./sq. ft.	0.15	0.29	0.44	0.59	0.73	0.88	1.02	1.17	1.32	1.47	2.94	4.40
$ gold*/sq. ft.	5.25	10.15	15.40	20.62	25.28	30.80	35.70	41.00	46.20	51.49	102.98	154.47

* All figures based on the cost of gold at $3500 per troy ounce.

Specification table for plating gold.

KIRK & BLUM OVEN

Speeds Production for National Colortype Co.



KIRK & BLUM Ovens play an important part in the Nation's Business . . . definitely proven by performance in plants of many industrial leaders. A typical experience is that of the National Colortype Co., Bellevue, Ky., whose president, W. F. Grote, writes:

"Not only does the K & B Oven SPEED PRODUCTION, but it PRODUCES A BETTER PRODUCT. In the expansion of our operations, the installation of this oven has helped us solve another problem through the REDUCTION OF SPACE REQUIRED FOR DRYING OPERATIONS."

K & B Engineers will make a study of your oven requirements and submit recommendations to solve your baking and drying problems. Write for details of this service—no obligation.

THE KIRK & BLUM MFG. CO., 2816 Spring Grove Ave., Cincinnati, O.

Chicago Representative: C. P. Guion, 1661 North Milwaukee Ave.
Pittsburgh: The Bushnell M[illegible]chinery Company, 311 Ross Street.
Louisville: Liberty Eng. & [illegible]g. Co., Inc., 1450 So. 15th Street.

KIRK & BLUM PICKLING BASKETS and CRATES

LEAD-LINED STEEL TANKS • FUME EXHAUST SYSTEMS

along with it the resistance of the bath and from this data the current can be calculated using ohms law. Here again it will be seen that the current is being used to calculate the metal after all.

In order to illustrate the fact that there is no direct relationship between the voltage and current of the bath a cuprous cyanide solution was introduced into a Haring cell and a current was allowed to flow through the bath, using a copper anode and cathode. The current was allowed to flow for a comparatively short time and the voltage was taken. The data was obtained for different current densities and temperatures.

The results are recorded as shown in Fig. 2.

If the distance between the anode and cathode was changed an entirely different relationship resulted. Also if the concentration of the solution was altered, different data was obtained. The solution contained:

Cuprous cyanide	3 oz./gal.
Sodium cyanide	4.4 oz./gal.
Sodium carbonate	5.0 oz./gal.

In order to know the amount of metal deposited with any given voltage, the relationship between the current and voltage must be determined under conditions similar to that of the work being plated. Generally, it will be easier to determine the current density direct.

One question should be answered before leaving this important subject and that is, how one can determine the weight of metal deposited. This can best be obtained by weighing the anode or cathode before and after plating. The difference in the two weights will represent the metal deposited. For cathode efficiencies, a pilot cathode of any desired shape or size can be used instead of the ordinary work. Thus, a piece may be chosen which can be conveniently weighed. More of the pilot method will be discussed in the latter por-

GOLD AU+++

Electrochemical equivalent = 0.0006812
Density = 19.32
Weight = 0.00254 × 6.4432 × 144 × 19.32 = 45.51 grams

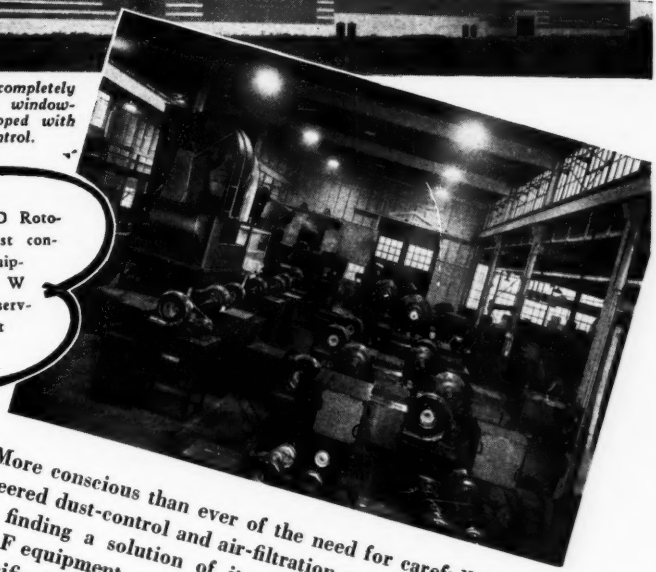
$$\frac{45.51}{1 \times 0.006812} = 66{,}980 \text{ sec.} = 1118 \text{ min.} = 18.6 \text{ hours}$$

C. D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	.002	.003
1	1-52	3-43	5-35	7-27	9-15	11-11	13-2	14-54	16-48	18-38	37-16	55-54
5	22	45	1-7	1-29	1-52	2-18	2-36	2-58	3-20	3-44	7-27	11-10
10	11	22	34	45	56	1-7	1-18	1-30	1-41	1-52	2-44	5-36
15	7	15	22	30	37	45	52	1	1-7	1-15	2-30	3-45
20	6	11	17	22	28	34	39	45	50	56	1-52	2-48
25	4	9	13	18	22	27	31	36	40	45	1-29	2-14
30	4	8	11	15	19	23	27	31	34	38	1-16	1-53
35	3	6	10	13	16	19	22	26	29	32	1-4	1-36
40	3	6	8	11	14	17	20	22	25	28	56	1-24
45	2	5	7	10	12	15	17	20	22	25	50	1-14
50	2	4	7	9	11	13	16	18	20	22	45	1-7
g/sq. ft.	4.55	9.12	13.62	18.20	22.70	27.22	31.80	36.40	41.00	45.51	91.02	136.53
Avoir. oz. /sq. ft.	0.16	0.32	0.48	0.64	0.80	0.96	1.12	1.28	1.44	1.60	3.20	4.80
Troy oz. /sq. ft.	0.15	0.29	0.44	0.59	0.73	0.88	1.02	1.17	1.32	1.47	2.94	4.40
$ gold /sq. ft.	5.25	10.15	15.40	20.62	25.28	30.80	35.70	41.00	46.20	51.49	102.98	154.47

Specification table for plating gold.

Simonds...the World's Most Modern Saw Plant...Specifies AAF Dust Control

America's first completely AIR conditioned windowless factory—equipped with AAF dust control.



28 Type D Roto-Clones for dust control on grinding equipment and 2 Type W Roto-Clones for servicing sand blast cabinets.

More conscious than ever of the need for carefully engineered dust-control and air-filtration equipment, industry is finding a solution of its dust problems in standard AAF equipment—*engineered* to meet the requirements of specific industrial applications.

The American Air Filter Company's Engineering Department is available to *you*—without obligation—to study your Dust Control problem and submit recommendations. Address Dept. 129.

AMERICAN AIR FILTER CO., INC.
INCORPORATED
LOUISVILLE, KY.

AIR FILTRATION AAF DUST CONTROL

tion of this article.

Another method of determining the amount of metal deposited would be to obtain the thickness of the plate and from this calculate the volume and weight of metal contained. The thickness of the coating can be determined in a number of ways. These will be given later in another paper.

There are very few cases in which the cathode efficiencies even approach 100 per cent. In the case of copper sulfate baths this is generally 90-95 per cent. For nickel baths it is also high. However, the cyanide baths in general give low results ranging from 50-80 per cent in most cases. Chromium baths give a very low figure, being around 10 to 15 per cent. The anode efficiencies are of indirect importance to the electroplate as will be shown below.

Suppose the anode efficiency is greater than the cathode efficiency, what will happen to the bath? If this condition is analyzed it will be seen that more metal is being added to the bath by the anode than is being removed by the cathode. Under these conditions the metallic ion will build up in the bath or the bath will become more concentrated in terms of the metal being deposited. The metal ion will take the place of hydrogen ion in solution which is another way of saying that the pH of the solution will increase. It must be remembered that an increase in pH indicates a decrease of hydrogen ions. Conversely, if the anode efficiency is less than the cathode efficiency, the solution will become depleted in regard to the metallic ion being plated and the pH will decrease or the solution will become more acid. These are important facts because they all have a direct bearing upon the current efficiencies. Also, if such a bath is not checked periodically, it will finally reach the point where an acceptable plate will not be obtained.

With the above in mind it can be said that current efficiencies of 100 per cent are seldom obtained. However, the current efficiency should be as high as possible and the anode effi-

BRASS 70-30

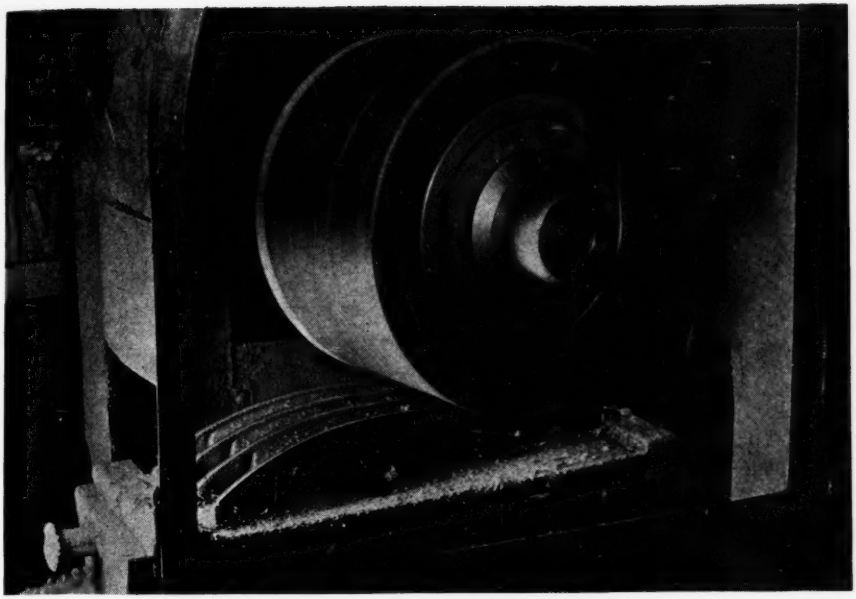
Zn^{++} 0.000339 × 30% = 0.0001017
Cu^{+} 0.0006588 × 70% = 0.0004612

Electrochemical equivalent 0.0005629
Density = 8.5
Weight = 0.00254 × 929.988 × 8.5 = 20.02 grams

$$\frac{20.02}{0.005629} = 35{,}580 \text{ sec.} = 593 \text{ min.} = 9.88 \text{ hours}$$

C. D.	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	.002	.003
1	59	1-59	2-58	3-57	4-56	5-55	6-55	7-54	8-54	9-53	19-46	29-39
5	12	24	36	47	59	1-11	1-23	1-35	1-47	1-59	3-57	5-56
10	6	12	18	24	30	36	42	47	53	59	1-59	2-58
15	4	8	12	16	20	24	28	32	36	40	1-20	1-59
20	3	6	9	12	15	18	21	24	27	30	1-0	1-29
25	2	5	7	9	12	14	17	19	21	24	47	1-11
30	2	4	6	8	10	12	14	16	18	20	40	59
35	2	3	5	7	9	10	12	14	15	17	34	51
40	1	3	4	6	7	9	10	12	13	15	30	45
45	1	3	4	5	7	8	9	10	12	13	26	39
50	1	2	4	5	6	7	8	9	11	12	23	35
g/sq. ft.	2.00	4.00	6.00	8.00	10.01	12.01	14.01	16.02	18.02	20.02	40.04	60.06
oz./sq. ft.	0.07	0.14	0.21	0.28	4.35	0.42	0.49	0.57	0.64	0.71	1.42	2.11

Specification table for plating brass.



On Machine Fed Jobs
You'll Like the Uniformity of Alundum Abrasive

ON machine fed jobs such as this the abrasive is strictly "on its own." The operator can not favor the abrasive — varying pressure and length of time according to the "feel" and speed of the cut — as he can on work held by hand.

And because Alundum Abrasive can be depended upon to operate "on its own" it is popular on all types of automatic machines. Its uniformity — not only in grain size but also in grain shape and capillarity — gives the uniformity in wheel heads that is so essential — uniformity in finish, in cutting action and in wheel life. Adjustment time when wheels are changed is reduced to the very minimum.

NORTON COMPANY, WORCESTER, MASS.

G-88

NORTON ABRASIVES

ciency should equal, if possible, the cathode efficiency so that an unbalanced solution may be avoided. The above may be summarized as shown in Fig. 3.

For the sake of clarity it is assumed that all the current not dissolving or depositing the metal in question is utilized in either liberating oxygen at the anode or hydrogen at the cathode.

From the above it can be seen that for the best results the anode efficiency should equal the cathode efficiency and both should be as near 100 per cent as possible.

From this discussion one is now ready to use the table on specification plating with the understanding of all variables used except current density and its determination. It will be recalled that this factor was plotted against thickness of deposit in order to obtain the time of deposit. As can be seen from the phrase itself, the meaning implies the denseness of current. This can be defined as current per unit area and can be given as current per square decimeter or current per square foot. Thus, 20 amperes per square foot indicates that for each square foot of area in an electroplating bath, there are 20 amperes passing through the cathode surface. If there are 2.5 square feet there must be a total of 50 amperes registering on the ammeter which is in series with the tank. This is rather easy to write about but difficult to put into practice in many cases because the area of all material being plated must be determined.

If the work being plated is uniform, for instance, automobile bumpers, the area will be the same and one determination will be all that is necessary. However, if irregular sizes and shapes are being finished, for instance, a silver holloware line, there are innumerable areas to be calculated. In one plant with which the author is familiar, all areas are calculated by the engineering department and the plater gets this information off the blue print. It is a simple matter for the plater to add up the area in each tank load and to then apply the correct current. This is time consuming and therefore expensive. Knowing this, an attempt was made by the author and Mr. S. C. Taormina to devise a method whereby the area of the individual pieces would not have to be determined.

The plan was as follows: Place into the bath containing the work to be plated, a pilot cathode having a definite area. An ammeter and suitable resistance was connected in series with this electrode so that the current flowing could be determined. Thus, the current flowing through the pilot of known area could be determined and in this way the current density could be calculated. If the current density of the work was the same as that of the pilot, the problem would be solved. Many runs were made in which a number of hollow ware articles, such as loving cups, water pitchers, gravy bowls, trays, goblets, and so on, were plated. The pilot was racked in with the work and plated during the run. It was shown conclusively that such a system is practical if used with precautions. These are as follows:

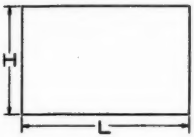
1. Work must be distributed in the tank as evenly as possible.
2. The load which is being plated in any one tank must be similar in shape and size.
3. All electrical connections must be clean.
4. In order for the pilot to give the correct current density it must be properly spaced in reference to the anode and cathode areas.

Before the pilot cathode method can be adapted to any production

scheme it is essential that several loads of work be plated and the amount of metal deposited determined. The variables should be adjusted so that the pilot cathode will give the correct reading.

In many cases it will be found best to determine the area of the pieces and then to calculate the correct current in order to obtain the desired current density. In order to aid the electroplater there are listed below several formulas for calculating areas which will prove helpful.

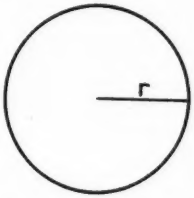
Area of a square or rectangle with a length of L and a heighth of H:



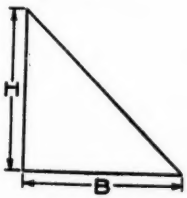
Area = Length × height = L × H.

Area of a circle with radius r:

Area = 3.1416 × r × r = 3.1416 r^2.



Area of a triangle with base B and heighth H:



Area = ½ height × base = ½ HB.

When an object is completely immersed in a bath the solution touches its surface on all sides. Therefore, the above areas must be multiplied by two in order to account for both sides.

Area of the curved surface of a

Adheres Perfectly to Brass Bakes Quicker at Lower Temperatures*

Ultrakote Synthetic is an urea formaldehyde that has the appearance of Porcelain. But in addition this surface will withstand denting, bending, hammering and all sorts of abuse.

Ultrakote bakes to an extremely tough, flexible, hard finish at 150°F. for 30 minutes —at 200° F. for 15 minutes—at 300° F. for 10 minutes.

You'll want to know more about this modern and better finish — write today for details.

*And all other metals.

C. W. HAYNES LABORATORIES INC.

50 CHANDLER ST. • SPRINGFIELD, MASS.

ADVANCE MODERN WRINKLE...

can assure you thoroughly dependable wrinkle finish, combining uniformity, durability, and economy in a one-coat wrinkle finish. This wrinkle is now made in colors from the lightest pastel shades to deep browns and blacks and in very fine to coarse pine tree textures. May be made to suit your baking schedule as well as your product. Prove for yourself what it will do in your plant.

ADVANCE PAINT CO.
INDIANAPOLIS, INDIANA

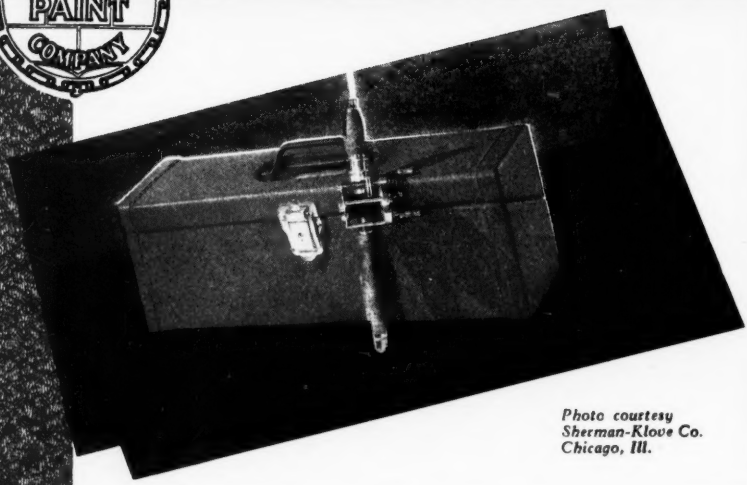
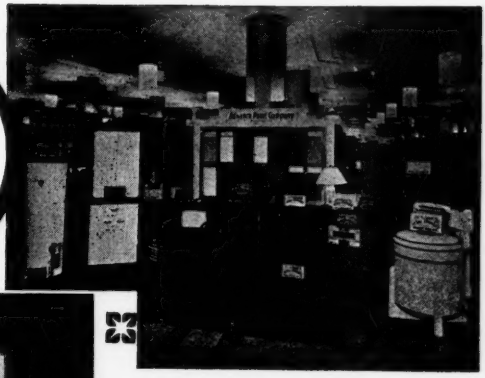
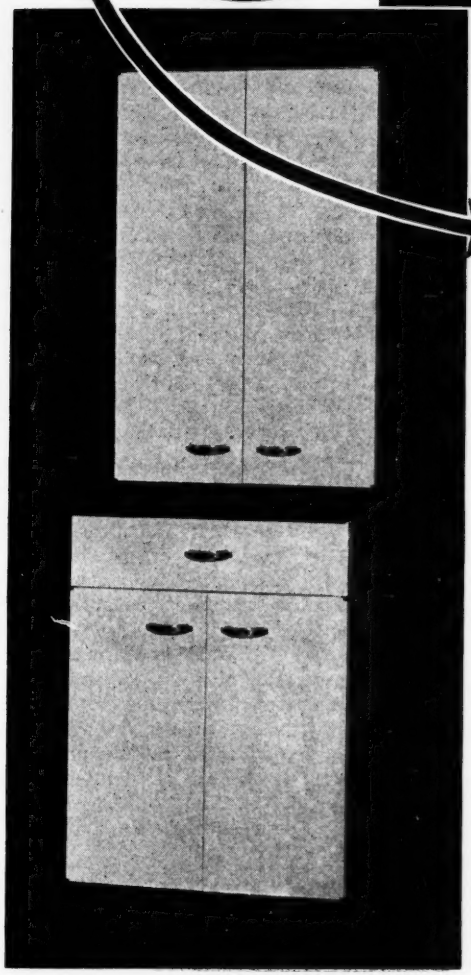


Photo courtesy Sherman-Klove Co. Chicago, Ill.

LOOKS AND FEELS LIKE PORCELAIN





Advance

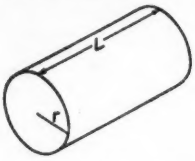
PORCENITE

The "porcelain-like" finish on this steel cabinet is Advance PORCENITE—a one coat bake that is formulated in both regular and short bake types. Supplied in white, black or colors. The price range in each of these types makes it an economical finish, adaptable to any specified use — and especially for some of the products shown in one of our exhibits as pictured above.

ADVANCE PAINT CO.

INDIANAPOLIS • INDIANA

cylinder with a radius of r and a length of L:



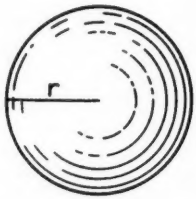
Area = 6.28 × radius × length = 6.28 rL.

The total area of a cylinder included the surface of both ends.

Area = 6.28 × radius × radius + radius × length.

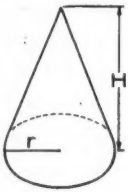
Area = 6.28 r^2 + rL.

Total area of a sphere with radius r:



Area = 12.56 × radius × radius = 12.56r^2.

The area of a curved surface of a right cone whose altitude is H and radius of base is r:



Area = 3.1416 × radius × square root of radius squared + height square = 3.1416 × r $\sqrt{r^2 + H^2}$.

The total area of such a cone is: Area = (3.1416 x r^2) + (3.1416 × r $\sqrt{r^2 H^2}$).

From the above formulas the area of almost any object can be obtained. If all the cathode areas of a given tank are added together and divided into the total number of amperes entering the bath, the average current density will be obtained. In order to make sure that all the current entering the tank is applied to the work only, all conducting surfaces connected to the cathode bar which extends into the solution should be insulated. Thus all racks, cathode bars, hooks, and so on, should not have exposed metallic surfaces to the bath, as some metal will be deposited on these areas and not on the work. This, of course, acts as a thief and receives metal which should, according to the calculation, go on the work. Such can be prevented by coating the exposed parts of racks, hooks, and so on, with an insulating material such as a lacquer or a rubber paint.

In plating to specification it is essential that metal be deposited upon clean surfaces; otherwise peeling will result and no coating will be retained. Also, due to the difference between the anode and cathode efficiencies and drag out, there will always be a tendency for the constituents of a bath to change. Therefore, it is essential that all baths be checked and corrected periodically for the components of the bath so that consistent results can be obtained day after day. This is very important and essential and must not be overlooked.

Summarizing we may say:

1. There are three demands for specification plating, (a) theoretical amount of metal, (b) time required to plate it, and (c) a method of checking the results. The practical time is always greater than the theoretical period due to a cathode efficiency which is always less than 100 per cent. Current densities can be indicated by using a pilot cathode of known area, provided certain precautions are exercised. Formulas are given for determining surface areas, electrochemical equivalents and current efficiencies.

In another paper the author will give methods checking thicknesses of various electrodeposits.

In the first article of this series on

"Plating to Specification," which appeared in the October, 1938, issue of PRODUCTS FINISHING, several errors appeared. These errors are as follows:

Page 52, table on Cu+, 21.00 divided by 0.0006588 K. The K does not belong there.

Page 53, table on Chromium+. This should be $Cr^{6}+$ as chromium has a valence of six.

Page 53, table on Ni-Co. Change No++ to Ni++.

Page 54, table on tin, last one should be SN++++ not Sn++.

Page 55, table on zinc. The electrochemical equivalent of zinc is given in the first line as .000399 and in the last line as .000339. The last one, .000339 is correct.

Duraplex Alkyd Resins. A new booklet describing Duraplex alkyd resins has just been published and is now being issued by The Resinous Products & Chemical Co., Inc., 222 W. Washington Square, Philadelphia, Pa. Alkyd resins are the basis of a wide range of modern finishes and the Duraplexes have had a leading part in their industrial adoption.

The booklet outlines the general functions of alkyd resins in the coatings files, and so on with ⅛ or $\frac{3}{16}$ in. diameter.

Copy free upon request.

Air and Gas Compressors. Sullivan Machinery Company, Michigan City, Ind., has prepared a catalog describing its line of advanced design air and gas compressors known as the Class WN-112. This 16-page catalog illustrates a variety of the many industrial installations made since this compressor was announced in 1937 and illustrates the major construction details in a clear, simple manner. The compressor is built in sizes from 378 to 1,600 cu. ft. per minute displacement (60 to 250 h.p.) for commercial pressures.

Copy of Bulletin A-18 free upon request.

Mention PRODUCTS FINISHING when writing to advertisers. Your co-operation will be appreciated both by the advertiser and this magazine.

quote:

"- - - steel parts treated with Pentrate, not only have an attractive black finish, but also show an increased resistance to 'rub-wear' and 'galling'---"

Full details in the **"BLACK"** bulletin

HEATBATH CORPORATION, Springfield, Massachusetts

Sole Manufacturers of PENTRATE—Pats. pending

SPRAY EQU
THAT FITS T

BINKS
makes everything fo
SPRAY FINIS

Spray Guns—Spray oths-
tainers—Regulators-xhau
and Connecti—Ac

Write, Ph or Wi
for the BINK resen

BINKS MANU CT
3114-40 CARROLL AVE C
Telephone Bure
NEW YORK D T
126-36 Lafayette St. 105 E. e Ave,
Phone: Canal 6-4640 Phone: n 7237
Philadelphia—Pittsburgh— nd—M
—Los Angeles—Seattl idest, C

Binks SPRAY SYSTEMS

QUIPMENT
TS THE JOB

INKS
hing for Complete
FINISHING

ay Booths—Material Con-
rs—Exhaust Fans—Hose
ctic—Accessories

, Pl or Wire
INK resentative

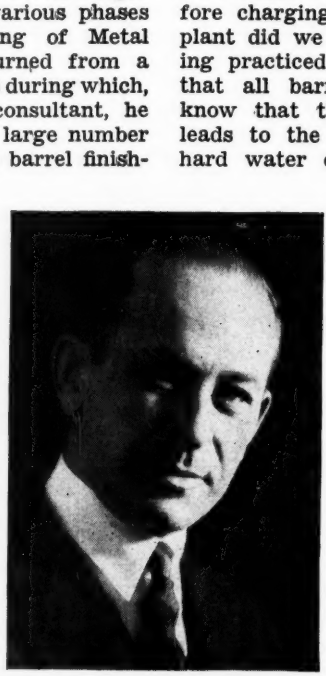
NUFACTURING CO.
CHICAGO, ILLINOIS
ne: Buren 4200
SAN FRANCISCO
E. re Ave. 778 Brannan St.
ne: n 7257 Phone: Market 7418
h— and—Milwaukee—Boston
tti dson, Ontario, Canada

Barrel Finishing of Metal Products

A discussion of current phases of barrel finishing.

By H. LEROY BEAVER

YOUR author of this series of papers covering the various phases of the Barrel Finishing of Metal Products has just returned from a somewhat extended trip during which, in his capacity as a consultant, he was required to visit a large number of establishments where barrel finishing in some form or another was practiced. The observations made on this trip point to the necessity for stressing at least seven phases of the subject, which while we have heretofore commented on during the series, now seem to be of more than ordinary importance, and which should be stressed in view of the conditions found to prevail in most plants visited.



H. Leroy Beaver

First of these was the importance of the water used both in charging the barrel for its normal operation and, secondly, the type and condition of the water used for the rinsing after the actual burnishing operation had been completed.

While we have repeatedly stressed the fact that hard water, if that was the normal and regular supply, should be reduced to zero hard or soft before charging the barrel, in no one plant did we find this operation being practiced. In spite of the fact that all barrel operators should know that the use of hard water leads to the formation of insoluble hard water curd soap, we find no effort made to soften the water to prevent this condition. These hard water curds lodge on the parts and are always most difficult to rinse away in the final process, and not only this, for while the insoluble curds present their own difficulties, we are always faced with a more difficult problem; i.e., the formation of a coating of insoluble lime soap on the surface of the steel burnishing materials. Once this formation is present, no alkaline cleaning, rinsing in gasoline or kerosene, will remove this deposit, and for all practical barrel finishing purposes, one might almost as well employ small balls of cement, because these hard lime soap deposits will be abrasive in character up to the point where bright, clean

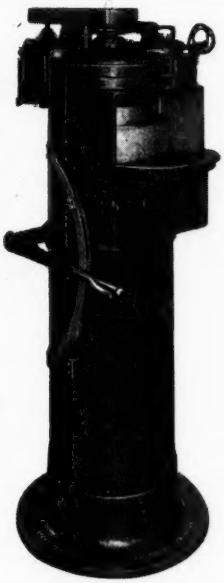
and lustrous finishes are practically impossible.

If the problem of reducing this normal water supply from its seven to sixteen grains of hardness as we have found it to zero hard or soft water were a difficult one, then it might more easily be understood why such a condition should exist, but the operation is so simple that a child could easily accomplish it. All one has to remember is that the figure "one" appears in three successive phases of the operation of reducing water from its current hardness to zero hard or soft. Once having determined from your water supplier the number of grains of hardness per U. S. gallon of your water supply, the simplest rule to reduce this water to zero hard or soft is to observe the following formula:

1 ounce of trisodium phosphate per
1 grain of hardness per
100 gallons of water.

In operation this would simply mean that if your water supply was determined to be nine grains hard per U. S. gallon, you would simply add nine ounces of trisodium phosphate per 100 gallons of water to reduce the water from nine grains hard to zero hard or soft. If this rule is followed, it will most effectually prevent not only the formation of insoluble hard water soap curds, but also the formation of insoluble lime soaps on the surface of the burnishing materials. While it may be true that other means might be employed in correcting hard water conditions, such as the installation of water softening equipment, for all practical purposes we have found that following the above formula provides a most effectual answer to this most perplexing problem.

Coming to the second phase of the water problem; in all but one instance we found that cold water only



"Speedip"

WHIRL ENAMELER

Saves Time -- Saves Enamel

● A combination dipping-whirling machine for completely coating large quantities of small parts with lacquer, enamel, paint, etc.

All operations are within the machine. Parts are dipped into coating material, raised and whirled. Time as little as 30 seconds. Speeds up production—cuts finishing costs —saves lacquers and enamels.

Write for further details or send samples to be coated.

RONCI MACHINE COMPANY

45 RIVER AVENUE • PROVIDENCE, R. I.

was used both in charging the barrel as well as for the rinsing operation after the completion of the run, and in every case far more water than was necessary was being used. Every barrel operator should know that soap goes into solution much more slowly in cold water than in hot water, and where hot water is not provided, either for the original water charge or for rinsing after completion of a run, it sets up two conditions; first, too long a time for the charge of soap to go into solution to provide the necessary lubrication, and a second, and perhaps more serious, condition that arises in this way.

In all barrel operations a certain amount of heat is generated so that in dumping a barrel load of work it will be invariably found that the parts are quite warm and covered with soap solution or suds. To suddenly quench these warm parts with cold water just as it comes from the water main is really too much. What happens is that a film of the grease base of which the soap is composed immediately forms on the surface of the parts where it provides another difficulty for the plater when he comes to depositing the plate which, of course, is expected to adhere to the base metal. In cases where this is the practice and where the work is taken directly from the burnishing operation to the plating barrel or tank, difficulty may always be expected.

While on the subject of water, we wish to stress another phase of the use of water and in its proper proportion in the barrel finishing operation. It is, of course, familiar practice and common knowledge that to prevent rust or oxidation of the burnishing material when it is not in active use r e q u i r e s that the material, whether in or out of the barrel, be kept covered with from one to two inches of soapy water. This, of course, is the proper thing to do, but it does not follow from this that the same rule must be observed in charging the barrel with water with the start of each load, for to do so almost automatically sets up an additional problem that very few barrel operators have realized until it is pointed out to them right on their own floor and in their own barrels.

While it may be a bit difficult to paint a word picture of just what we mean to convey we will at least attempt it, but it will require some help from the reader. With this text before him, let him take a piece of paper and on it draw a circle of approximately six inches diameter. This will represent, let us say, a side view of an Abbot type of barrel sixteen inches wide and thirty inches in diameter. Now draw a curved arrow pointing from right to left around this circle to indicate that the barrel is operating in a counter clockwise direction. All barrels to operate at their maximum should be loaded at least two-thirds full, and in order to show the level of the load the reader should now draw a horizontal line through the circle one-third of the way from the top. This line indicates the level of the burnishing mass within the barrel. Now draw another line directly above the line representing the load level and this line will represent the one or two inches of water that covers the entire mass.

Next, let us assume that you have simply tossed into the barrel what you generally consider a n o r m a l charge of soap, and in most cases this will be in flake or chip form. This will float on top of the water. Let us now assume that the barrel is ready for operation. If you will stand before an actual barrel so that the opening can be easily looked into and the level of the mass observed,

your next step will be to take hold of one of the cross bolts which hold the sides of the barrel to the center shell and draw the barrel slowly towards you. In doing this you will note that while the water level remains constant, the mass of burnishing material on the far side of the barrel, in this particular size, will rise between six and seven inches above the water level before the mass starts to flow (you will note that we do not use the world "roll"), and that the level of the mass immediately in front of you has sunk into the water to a depth exactly equal to the rise of the material on the far side of the barrel.

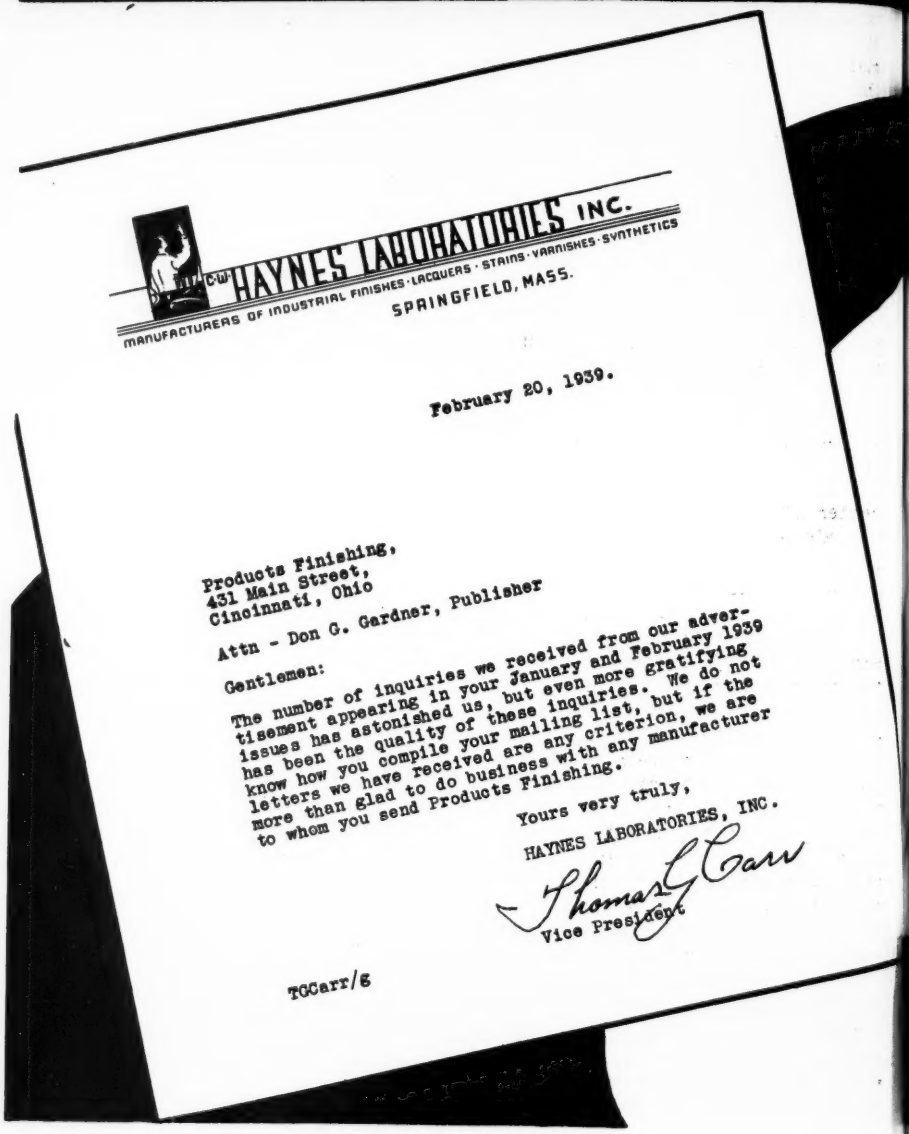
To indicate this on your sketch, you draw a line that would indicate this shift in the mass, and this will clearly indicate to you that in the barrel immediately in front of you, you will find a puddle of water six to seven inches deep at the periphery of the barrel, and tapering toward the center of the axis of the barrel, and this also represents your trouble spot. In throwing the barrel into operation, the soap that floats on the surface is immediately thrown forward with the first surge and finds itself in this same puddle. The burnishing mass, having risen on the far side of the barrel, in its normal flow simply rides under this water pocket and the soap floating on the surface requires a far longer time to go into solution and provide the necessary lubrication. We have opened barrels that have operated for as much as twenty minutes and by reaching down into the barrel directly in front of us we have felt about and had no difficulty in gathering up a handful of floating curds of soap that had not gone into solution.

Now, to overcome this condition, and we very frankly say to you that it is most important, the simplest thing is to reduce the water level to a point below the level of the burnishing material on the side of the barrel periphery closest to you as you face the barrel. This may be a bit difficult for you to determine, and so a very easy rule to follow is this: Fill the barrel with water until it just reaches the surface of the mass, counting the number of gallons required to reach this level. Now empty the water out of the barrel and put back into the barrel just half as much as you used to bring the water up to the level of the burnishing mass.

If you will follow this rule, you will find that the soap you add will be immediately carried down into the mass and will provide lubrication for the parts passing through it. Don't be concerned if you do not find as high and as thick a lather crown over the mass when you empty the barrel, for the lather as such is relatively unimportant and in most cases an excess of it simply provides additional difficulty to rinse it away. Indeed, much of our more recent research has been toward the development of a soap for burnishing purposes wherein the lather would be subdued; in other words, the search for a suitable material to be added to the normal soap formula to act as a defoamer. We do not require a profuse lather on the surface of the mass for, after all, the one principal function of a soap in barrel finishing is to provide lubrication within the mass to the parts passing through it.

All of the above quite naturally leads to a discussion of the soap itself. In practically every case on this extended trip the operator of barrels insisted that he was using a "neutral soap." Now, while neutral to the plater may be indicated by pH 7, soaps that stay within the range up to pH 10.2 are rated as neutral soaps. An average of seventeen kinds of soaps used in burnishing

PRODUCTS FINISHING Gets Res



HAYNES LABORATORIES INC.
MANUFACTURERS OF INDUSTRIAL FINISHES · LACQUERS · STAINS · VARNISHES · SYNTHETICS
SPRINGFIELD, MASS.

February 20, 1939.

Products Finishing,
431 Main Street,
Cincinnati, Ohio

Attn - Don G. Gardner, Publisher

Gentlemen:

The number of inquiries we received from our advertisement appearing in your January and February 1939 issues has astonished us, but even more gratifying has been the quality of these inquiries. We do not know how you compile your mailing list, but if the letters we have received are any criterion, we are more than glad to do business with any manufacturer to whom you send Products Finishing.

Yours very truly,

HAYNES LABORATORIES, INC.

Thomas G Carr
Vice President

TGCarr/g

ts Results for Haynes Laboratories Inc.!

"The number of inquiries . . has astonished us . . ."

"..even more gratifying has been the quality of these inquiries."

Letters like this testify to the ability of PRODUCTS FINISHING to perform a thorough merchandising job in the metal cleaning, plating, polishing and finishing field.

The circulation list of PRODUCTS FINISHING consists of over 15,000 hand-picked names, carefully chosen as **the** buying powers in the finishing field.

If your product is saleable to this field, PRODUCTS FINISHING will tell your story to the men you want to sell—and do it economically.

WRITE FOR FULL PARTICULARS

PRODUCTS FINISHING

PUBLISHED BY

GARDNER PUBLICATIONS, Inc.

431 MAIN STREET • CINCINNATI, O.

indicated this degree. Coming back to the question of hard water, we would like to impress on the reader the fact that the harder the water, the more soap will be required to saponify it and provide for the proper lubrication within the burnishing mass. It must be remembered, too, that hard water will quite naturally lead to the formation of insoluble hard water soap curds.

Previously in the course of this discussion we have mentioned the use of a neutral soap, but in every case this mention was predicated on the operator reducing the water used in his operation from whatever its degree of hardness might be to zero hard or soft, and further and altogether as important, wherever mention was made of neutral soap it was assumed that the operator of the barrel had seen to it that the parts before placing them in the barrel were as clean at least as they should be when ready to be placed in the plating barrel or tank. Time and time again in making surveys of plants where barrel finishing was used, we have been obliged to stress this factor of cleanliness of the parts prior to the barrel finishing operation.

For the same reason we have been obliged repeatedly to stress that the burnishing barrel was not a cleaning tank. Of this you may be sure—that indifferent or may we say almost no cleaning carries with it its own difficulties. Repeatedly we have seen parts and especially steel stampings come from the press with their original coating of slushing grease as applied at the mill. These parts after blanking and forming were simply tumbled in an oblique tilting type of barrel with sawdust to remove the excess of this slushing grease, and from this they went directly to the burnishing barrel, but invariably also the question of the operator is, "Why cannot we get a bright finish on these parts?"

The answer to this question should be obvious. Not only are the parts not clean in the sense that we understand and require a high degree of cleanliness before the burnishing operation is attempted, but it must be understood that a large part of the alkaline content of the soap used as a lubricant is exhausted in an effort to saponify what very often is insoluble grease, thus making the situation one of confusion worse confounded. It is vain for a barrel operator to tell us that the parts going into his barrels are scrupulously clean when he later shows us that the only operation done on them is simply a rough sawdust tumble to remove the excess of grease and dirt that may be on the surface.

Consider, if you will, that practically all stamped parts are porous, some have slag or scale imbedded on the surface, and when the parts are carelessly handled, deep scratches result from being dropped from the normal level of the bed of the press into the tote pans on the floor. In all such areas, pores, and so on, grease and dirt are lodged that simply cannot be wiped off or taken away by any such simple operation as a sawdust tumble. Even the utmost that manufacturers of cleaning compounds have been able to do, and in the face of an increasingly better understanding of the principles of capillarity as indicated by surface tension and wetting agents and their uses, we are still a long way from securing positively chemically clean surfaces on which to deposit our plating of various kinds, a condition definitely precedent to an assurance of assured adherence of the plate to the base metal. So with at least some degree of understanding of the necessities of the case, and if barrel

operators desire to deliver chemically clean surfaces on the parts as they go from the burnishing barrel to the plating operation, it must be insisted that the same degree of cleanliness be used on parts before the actual burnishing operation as is definitely imperative of the parts when ready for the plating barrel or tank.

To secure such a condition of the parts prior to barrel finishing is not so difficult, for in a vast majority of the plants where barrel finishing is practiced it is almost invariably as a step in the production cycle of preparing the parts to receive their plated surface, and in such plants the plater is generally familiar with cleaning methods and materials he uses on his parts prior to the actual plating. While it is true that securing the necessary cleanliness of the parts prior to burnishing requires an additional operation, the item of time and cost is well spent by the assurance that such a cleaning operation goes far toward assuring definitely a more uniform adherence of the plate. Perhaps just as important is the fact that a barrel finishing operation prior to plating, where the proper cleaning cycle is used, provides two most essential things; viz., first that by pressure we close the pores and smooth the scratches on the base metal, and that by a previous cleaning operation we do all that we can do to prevent the pressure of the barrel finishing operation from more firmly imbedding foreign matter, dirt and grease into the pores of the base metal, where they most surely turn up later to cause rejection of parts which involves stripping and replating.

With the new cleaners that are being developed almost daily and the remarkable progress that is being made by electro-chemists in their efforts to secure cleanliness of the base metal prior to plating, we can only simply say that every magazine dealing with subjects of interest to the electroplater will contain, monthly, articles reporting progress of the important element of cleanliness, and if the suggestions contained in such articles are followed, we feel certain that within a very short time we will have a far better understanding of just what it is necessary to do both in operations preceding plating as well as those coming after the plated surface has been deposited.

We had planned to discuss in this paper the additional important factors of rusted burnishing material and what to do with it, barrel liners, the factors of underload and the proportion of parts to burnishing mass, as well as barrel speed, but sufficient space to provide for this is not available and these factors will be discussed in the paper to appear in the May issue of PRODUCTS FINISHING.

DRYING PROBLEMS MADE EASY

Use

NALCO DRITHERM

(Infra-Red Ray)

CARBON LAMPS

- Cuts drying cost and time.
- Provides drying equipment in minimum of space.
- Eliminates even "warming up" time.
- Secures uniform results.

Investigate this new method for drying and baking industrial finishes of many types... lacquer, paint, enamel, etc.

Free Information...let us send you data on radiant energy drying, baking and heating processes...let us help you solve your drying problems.

North American Electric Lamp Co.

1020 TYLER STREET, ST. LOUIS, MO.

Steel Surfaces Cleaned and Prepared for Painting by Means of Chemical Reaction

By Carleton Cleveland

FOR removing mill scale from steel plates and preparing the surfaces for painting (a preliminary step in the manufacture of steel storage tanks) the Chicago Bridge and Iron Company, fabricator of steel tanks, structures, and so on, has been using at its Greenville, Pennsylvania plant a method of pickling by a special process. This method can be compared favorably with the grit and shot blasting method, and is not much more costly. It leaves the surfaces smooth and clean, without a film of dust or dirt, and the last bath leaves a coating of iron phosphate on the steel, which is in itself a preservative and forms a splendid bond for the paint. Uniformly good results have been obtained by this method.

The pickling plant consists primarily of three rectangular vats side by side, as shown in illustrations Figure 2 and Figure 3. Before fabrication, the steel plates are placed in the first vat, which accommodates three or four of the largest pieces at on time, or an equivalent amount of structural steel. This vat, used for the removal of mill scale, contains a mild solution of sulphuric acid, brought to a desired temperature. After a specified length of time the steel is lifted from this vat and allowed to drain. To remove the remaining sulphuric acid, the steel is then dipped into the center vat, which contains rinse water of the same temperature as the sulphuric acid. The third vat, into which the steel plates are placed, contains a phosphoric acid solution to which iron

Fig. 1 — General view of pickling plant, showing plate being taken from the phosphoric acid bath.

Fig. 2—Plates on rack, set up edgewise, ready for painting.

phosphate has been added. This solution is hot and removes all final traces of acid and leaves a thin coating of iron phosphate on the steel.

The paint—a special red lead and graphite—is applied immediately after the plates have been taken from the phosphoric acid solution, having been placed on racks which hold them on edge. Painting them while still hot has its advantages. It reduces the drying period and also increases the bond between the paint and the metal. Edges that will overlap in fabrication are left unpainted. After erection, the joints are cleaned thoroughly and given a primer coat. Any slight damage to the shop coat is also touched up before the field coats are applied.

The contents of the vats are tested at specified intervals and the total acidity of the wash water is never allowed to exceed a specified maximum. The vats are heated to the proper temperatures by means of steam jets which are so arranged that they also agitate the contents. The plant power house provides high pressure steam for this purpose.

While drying, the painted plates are protected in inclement weather by portable covers, 12 ft. 3 in. x 38 ft. supported at both ends by a runway 9 ft. 8 in. high. These covers can be rolled aside when the plates must be handled into and out of the racks. When the weather is favorable the covers can easily be removed entirely by an overhead crane.

The sulphuric acid is purchased in quantity and is brought to the plant in tank cars and pumped to an elevated storage tank. When needed for replenishing the vat, it is drawn off to a rectangular measuring tank, and from there to the vat.

Mention PRODUCTS FINISHING when writing to advertisers. Your co-operation will be appreciated both by the advertiser and this magazine.

Porcelain Enamel— A Lifelong Finish

By E. L. STINE

PORCELAIN enamel, long valued as a material of great beauty in the field of decorative art, is coming more and more into general commercial use. This is because it provides a surface of great durability, applicable to the widest range of usefulness, and the future development of porcelain enamel in industry is based on the capacity of this material to carry enduring beauty in color and virtual indestructibility into the interior as well as the exterior finish of utility equipment, such as ranges, refrigerators, washing machines, bathroom fixtures, tabletops, kitchenware and so on, as well as houses, storefronts, and entire buildings.

Porcelain enamels are glassy compounds of inorganic materials, fused together under a high heat temperature of 2,500 deg. F. and applied and fired upon the metal at a heat of approximately 1,550 to 1,600 deg. F. so that they become a part thereof, and will resist impact, temperature changes, acids, moisture and age.

Paints, lacquers, japans and similar finishes, are baked upon the metal at comparatively low heat temperature, approximately 240 to 400 deg. F. They, too, are called "enamel," but being of organic materials, are affected by light, heat, air, moisture and age, they change in color, and sometimes change in physical properties. Although porcelain enamel is a glass, it must adhere to the metal, which necessitates the addition of other ingredients besides those used in the making of ordinary glass.

The raw materials in their proper proportions are weighed out and mixed in a large machine and then charged into a melting furnace, maintained at a temperature around 2,500 deg. F. The melting is done either in reverbatory or a rotary furnace fired by gas, oil or coal, omitting coal for the rotary. It takes from 1 to 2½ hours, depending on the kind and size of the mixture.

After a short while the mix will begin to melt, the fluxes starting first, carrying the silicas with them, and when completely liquified will have stopped boiling. A sample is removed by means of a heavy iron rod, which is introduced into the molten mass. A quantity the size of an orange is taken out. The end is held up in the air to allow the hot glass to drip to form into a thin string. This thin string is taken in the fingers and pulled and pulled until it becomes too chilled for any further pulling. It is inspected, and if there are no "knots" or grains of unmelted material in it, it is done, and ready for withdrawal from the furnace.

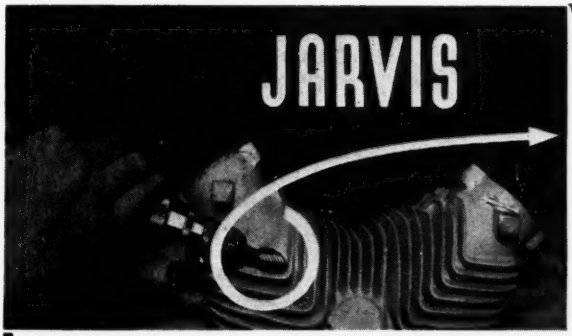
A clay plug in the base of the melting furnace is broken away and the molten glass is allowed to flow out and into a tank of cold flowing water. The molten mass breaks up into very fine particles which are called "frit." This is shoveled out, or, if a wire basket was used in the tank, it is lifted out, and the water allowed to drain off. The frit is then put into a

dryer to evaporate the water. There is an estimated loss in the melting of 15 to 25 per cent caused by decomposition of certain constituents which give off their water, or by partial loss of hydrofluoric acid from others of the materials. From the borax in the mix we lose 47 per cent of its water content, soda ash loses 41 per cent and saltpeter loses 61 per cent, besides, we figure a loss of 2 to 3 per cent due to the handling of the chemicals. After the frit is dried, it is stored in clean, covered bins, each one kept by itself free from dirt. The chemicals used also are kept in clean bins, kept dry, since many draw moisture, which increases their weight, and to use them in that state, the weights would not be correct.

Following the process, we put, according to the capacity of the revolving porcelain lined mills, that quantity of a given frit, to which is added a special kind of clay which will hold the finished enamel in suspension, and add a correct amount of water as a vehicle. When the glass has become milled to the desired fineness, the mill is emptied into containers, passing the enamel through fine sieves.

There are two kinds of enamel, one, the base, or ground coat, the other is the cover coat. The base enamel contains metallic oxides, which fuse into the steel and act as a bond, the cover coats may be of any desired color, and are made by adding color to the milling process.

The pieces to be enameled must be absolutely clean before applying the enamel. The pieces are now given a coating of the base or ground coat, evenly applied either by immersion or the spray gun as the case may require, and then dried at about 120 deg. F. This coating is subsequently fired in a muffle furnace, or in a continuous furnace at 1,550 to 1,600 deg. F. and then allowed to cool. The



ROTARY FILES
and
Flexible Shaft Machines

For Faster, More Efficient Finishing of Castings, Welded Joints
Files are precision ground from the solid — can be re-ground.

Write for complete 28-page catalog.

Catalog illustrates the wide line of JARVIS cost-saving equipment for rotary filing, polishing and grinding operations.

THE CHAS. L. JARVIS CO. MIDDLETOWN CONNECTICUT

workpiece, if it is to be finished in white or colored, is either immersed in a colored enamel if finished on both sides, or, it is sprayed if finished on one side, then dried and fired again. It is then given a second cover coat and another firing. Pyrometers and timer clocks are used to control the heat and firing time. The procedure is the same whether it be parts of a building, or a piece of kitchenware, excepting that this ware is seldom sprayed. Some pieces are laid flat in the firing and others are hung.

A good enamel finish starts with the metal to which it is applied. The metal must be de-gasified and uniform, and only the best ore can be used in the making. Standard soft steel may be made by the Bessemer or the openhearth process and having approximately the following composition gives the best results when properly treated during the enameling process.

Carbon	.040 to .050%
Phosphorus	.030 to .090%
Manganese	.060 to .040%
Sulphur	.05 and under
Silica	.01 and under

Physically it should possess the following co-efficients:

Tenacity	35 to 38%
Contraction	56 to 65%
Elasticity	30 to 38%
Specific Gravity	7.6 to 7.8%

The sheets are annealed under cover at a temperature of about 1,400 deg. F. for 14 to 16 hours. The high iron content and the low phosphorus content make it very ductile and well adapted for enameling purposes. Gages running from 28 to 16 U. S. Standard are those generally used for our purpose and metals that are too light will result in undue warpage, and the coated sheets cannot be straightened or flattened.

The process of enameling requires a more or less elaborate equipment, and to demonstrate, we will start with the black or raw metal shape or sheet as it comes into the enamel department. The grease, oil, dirt, and so on gathered by the press, lathe or drill must be removed. A boiling caustic solution in a steel or lead lined tank is used and requires about 10 to 15 minutes. The pieces are then lowered into an adjoining tank of flowing clean water, raising and lowering the crate several times to assure a good rinsing. The next and important step is the "pickling" of the pieces which are now lowered, in the same crate, into a sulphuric acid solution of 5 to 6 per cent strength, or a muriatic acid solution of 11 to 12 per cent. The former used hot at 150 deg. F., while the latter is used cold. The time required is about 10 to 20 minutes. When properly pickled, the crate is again lowered into the next rinse tank, after which it is lowered into a neutralizer tank for 3 to 5 minutes at 150 to 160 deg. F. and finally the crate is quickly rolled into a steam heated dryer. With the aid of a roller conveyor, the crate is brought to the inspector's section, where the pieces are looked over and passed on to the applier's department. An overhead trolley and electric hoist are used to move the crates along the line from cleaner to dryer.

The porcelain enamel used is composed of borax, feldspar, quartz, soda ash, fluorspar, bone ash, cryolite, oxide of tin, manganese, iron, cobalt. Two typical formulas are as follows: For the base coat,

Borax	120 lbs.
Soda Ash	32 lbs.
Saltpeter	48 lbs.
Fluorspar	48 lbs.
Quartz	60 lbs.
Ox. Manganese	18 lbs.
Ox. Iron	1 lb.
Ox. Cobalt	1 lb.

In the mill to each 100 lbs. of frit,

8 lbs. Clay
6 oz. Carb. Magnesia
40 per cent Water

For a white cover coat is mixed the following:

Borax	132 lbs.
Soda Ash	26 lbs.
Cryolite	100 lbs.
Fluorspar	3 lbs.
Feldspar	130 lbs.
Quartz	130 lbs.
Saltpeter	6 lbs.

In the mill to each 100 lbs. of frit,

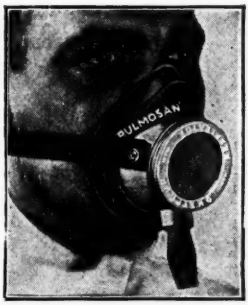
6 lbs. Clay
8 lbs. Ox. Tin
30 per cent Water

For making colored enamels, oxides of whatever color is desired are used. The oxides are bought from an oxide manufacturer and are added to the mill in the proportion to produce the correct shade.

It has been found a difficult and expensive problem to remove the enamel finish from the metal after it has been fused into it, and at best, the piece is rarely saved. This refers to an attempt to refinish a piece that was spoiled in the process, perhaps by mutilation, over, or under firing, or improper cleaning of the steel.

Porcelain enamel signs which were erected as long as 25 years ago are still as brilliant and alive today. Some types of automobile manifolds are now getting a porcelain enamel finish to prevent rusting and scaling and prolonging their usefulness. Roofing shingles are being made of sheet steel or copper and have a porcelain enamel finish in different colors. Those houses will never have to be reshingled, nor the enameled waterspouts renewed. Thus, we see that porcelain is a lifetime finish.

In producing a "grain" finish on enameled pieces, it is necessary to apply and fire the base or ground coat, and a cover coat of the re-



STOP ACCIDENTS
BEFORE THEY HAPPEN!

Beat accidents to the punch! Safeguard all "danger spots" in your finishing shop with Pulmosan Safety Devices. The items on this page will efficiently protect workers' eyes, lungs and bodies against prevalent hazards in your shop. Write for details and prices.

PULMOSAN SAFETY EQUIPMENT CORP.,
Dept. PF, 176 JOHNSON ST.,
BROOKLYN, N. Y.

RESPIRATORS
for
Dusts, Fumes, Sprays

•

GOGGLES
for
Grinding, Polishing, Acids, etc.

Carboy Truck
Carboy Tilter
Carboy Drainer and Siphon
Sandblast Helmets
Acid Hoods
Acid-Proof Gloves, Aprons, etc.
Acid Pails and Dippers

• *Write for leaflet, "Safe Handling of Acids and Chemicals," for details.*

quired color. Ordinarily, the graining is applied upon the fired cover coat and fired. The graining pattern is etched on a copper plate which is inked by applying the graining paste over it, then carefully scraped over the surface, care being taken to obtain an even spread. A smooth composition roll is then rolled over the plate, picking up the impression, after which the roll is passed over the surface of the enameled piece, thus transferring the pattern to it. The plate is cleaned off after each impression.

Another method of graining has been developed whereby the pattern is taken directly from the prepared natural wood panel. The preparation of such a panel requires treatment of the wood with chemicals which remove the soft grain lines. The inking and scraping is also used with this process. Hand production of imitation graining is done by applying the graining color to the enameled surface with a brush. Clove oil is used as a vehicle for the graining material, and is usually a black glaze. This is made by grinding together 1 part of glaze (colorless enamel) and 2 parts clove oil and mixing to the consistency of a paste. After applying this paste, a graining brush or a sponge is drawn over the surface to produce an effect similar to the natural wood.

For reproducing marble, the impression is taken direct from the etched marble slab. Here, too, a paste is evenly distributed over the marble slab and the design transferred from a roller and then to the enameled piece. The marble slab is etched by means of a light sand blasting, with a subsequent light polishing to remove the roughness. The only kind of marble that can be prepared for our purpose is that in which the spaces showing the pattern are softer in composition than the predominating area. There are marbles where the veins are attacked by acid, whereas the predominating areas are not. After the graining operation, the pieces are ready to fire.

Some types of burial vaults are pressed out of heavy gage steel and are finished in imitation mahogany. After the usual cleaning process, they are enameled with the base coat and fired. They are then coated with a dark red enamel and fired again. On this coat, the black graining paste is applied and the graining finished with a flat graining brush.

Monuments or headstones are generally made of cast iron, given the base coat and fired. A gray enamel is applied, and while this is still wet, a white enamel is spattered thereon, or dabbed on with a sponge in order to obtain a finish representing granite.

METSO CUTS CLEANING TIME
ONE PLANT using Metso 66 Cleaner cut the number of baths and rinses just in half. The quicker wetting and complete emulsifying action of Metso 66, special platers' cleaner, save time and expense. Economical, trouble-proof cleaning is worth looking into. Leading platers everywhere are asking for samples of Metso 66.
PHILADELPHIA QUARTZ CO.
General Offices: Ionic & 3rd Sts., Philadelphia
Chicago Sales Office: 205 W. Wacker Drive
METSO CLEANERS

"Greater Industrial Safety," a compact 12-page booklet stressing ways in which modern cleaning methods and materials provide increased safety of plant, product and personnel, has been issued by Oakite Products, Inc., 36 Thames St., New York, N. Y.

Designed to serve as a guide pointing out various industrial maintenance operations where improved safety is an essential factor, the booklet concisely reviews effective ways to eliminate commonly recognized fire hazards and fire hazardous conditions. Also discussed are the avoidance of certain well-known occupational hazards and the safeguarding of health through proper plant sanitation maintenance practices. Copies are available free on request.

Oakite Marks 30th Milestone in Business. Commemorating three decades of service to industry as originators and producers of industrial cleaning materials and methods, Oakite Products, Inc., 20 Thames St., New York City, has just released a special issue of its house organ, "Oakite News Service."

This special issue gives an interesting, historical review of the development of specialized cleaning methods and materials, and how they have contributed in helping American industry speed production and keep manufacturing costs low. It also includes a recital of the trends industrial cleaning research will most likely follow in the coming years. Copy free upon request.

New 1939 Chemical Formulary. A condensed collection of new, valuable and practical formulas for making thousands of products in all fields of industry is now being published by Chemical Publishing Co., Inc., 148 B Lafayette St., New York, N. Y. The New 1939 Chemical Formulary is the boiled-down essence of the latest commercial methods of hundreds of chemists, engineers, technicians, and professors.

The book contains more than 600 pages for thousands of formulas. There is no theory to wade through — just formulas and recipes for making thousands of products in the laboratory and factory. As a time and work saver it is practically indispensable to every worker in industry.

Copies of the New 1939 Chemical Formulary can be obtained by sending six dollars to Chemical Publishing Co., Inc., 148 B Lafayette St., New York, N. Y.

Power Industrial Trucks. The Elwell-Parker Electric Company, Cleveland, Ohio, has added two additional bulletins on power industrial trucks to their technical bulletin file. Bulletin A-8416 covers the Type EP-10 low lift platform truck and Bulletin A-8459 covers the Type ELN-10 high lift platform truck.

Both trucks have rated capacities of 10,000 lbs. and are equipped with the Elwell-Parker k-75 controller which allows for four speeds forward and four reverse. The trucks have dynamic brakes. The power plants on the EP-10 and ELN-10 are identical, each being of simple, rugged design and equipped with an Elwell-Parker 500 per cent overload, heavy duty and high torque motor. The trail axles are of the rocking type. All steering levers are above the axle for greater load clearance and accessibility.

The EP-10 and ELN-10 bulletins also illustrate other types of Elwell-Parker trucks, including fork, combination crane, apron, and so on. Copies free upon request.

Mention PRODUCTS FINISHING when writing to advertisers.

To Preserve Steel and Paint

DEOXIDINE prepares steel surfaces perfectly for painting. Prevents rust.

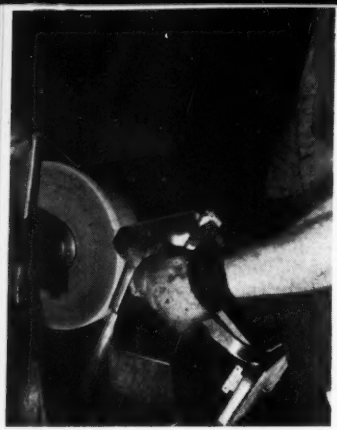
GRANODINE No. 30—Bonds paint and metal and preserves both.

THERMOIL-GRANODINE greatly reduces wear on bearing surfaces, and prevents rust.

Write for bulletins

AMERICAN CHEMICAL PAINT COMPANY

BOX 303, AMBLER, PENNSYLVANIA



NEWS of the Industry

Milwaukee A.E.S. Branch to Hold Annual Educational Meeting and Banquet

The Milwaukee Branch of the American Electro-Platers' Society extends a cordial invitation to all those interested in the art of electroplating to attend the Annual Educational Meeting and Banquet to be held Saturday, April 29th, at the Schroeder Hotel, Fifth and Wisconsin Aves., Milwaukee, Wis. An excellent educational program has been prepared and papers will be presented by outstanding men in the plating field.

The educational program will begin promptly at 2 p. m. and the banquet will be held at 7 p. m. in the Crystal Ballroom.

Claude B. Schneible Company Announces Appointment of Distributors

The Claude B. Schneible Company, 3951 Lawrence Avenue, Chicago, Ill., manufacturers of Multi-Wash Dust Collecting Equipment, have made the following appointments: O. W. Anderson, Los Angeles, representative for Southern California; Robert M. Taylor Company, San Francisco, for Northern California; King Machinery Co., Cambridge, Mass., will represent Schneible in the New England states; R. F. Skarnes, Minneapolis, has taken over the North Central territory, and Guy H. Rumpf will now handle the St. Louis territory.

L. C. Beers, formerly sales representative in the New England states, has been transferred to the Chicago office to fill the capacity of assistant sales manager.

Detrex Sheet Metal Division

In order to expand its services to industry so as to include not only metal cleaning but also certain production phases of finishing, the Detroit Rex Products Co., 13017 Hillview Ave., Detroit, Mich., has expanded its sheet metal manufacturing division.

Mr. I. J. Belanger, formerly of the Belanger Fan and Oven Company, Detroit, Mich., has been appointed manager of this division.

Included under this division are the manufacturing, marketing, installation, and servicing of industrial oven equipment, Bonderite and other rustproofing systems, alkali washers and stripping machines, and general sheet metal work such as tankage, bins, and so on. This division will also have supervision of spray booth installations.

Australian Abrasive Plant

Rapid expansion of the metal-working industry in Australia in the past few years has caused Australian industrialists, supported by the keen interest of the Australian government, to seek basic industries to round out their program. Agricultural implement plants have been expanded and a new one is in the course of construction. Steel plants, motor car assembly units and similar enterprises have contributed to this rapid industrial development.

Because of the dependence of modern

metal-working industry on efficient abrasive products, Australian interests sought the co-operation of American and British grinding wheel manufacturers in forming an Australian company to produce grinding wheels and allied abrasive and refractory products.

The new plant of Australian Abrasives Pty. Limited, will be located on a four-acre tract in the industrial district of Sydney, New South Wales. Construction will begin in about one month. Interested in the new company are the following: Carborundum Company, Niagara Falls, N. Y.; Norton Company, Worcester, Mass.; Universal Grinding Wheel Company, Limited, Stafford, England; and William McPherson of McPherson's Pty. Limited, Australia.

Perisphere Painted With DeVilbiss Equipment

A most interesting application of DeVilbiss spray painting equipment manufactured by The DeVilbiss Company, 300 Phillips Ave., Toledo, Ohio, was its selection for painting the New York World's Fair Perisphere.

Compressed air lines were run all the way from the ground for this unique job, and material tanks were mounted on the top platform. The size of the great structure, which measures over 200 ft. in diameter, is clearly shown by comparing it with the ladders and men around the edge of the platform as shown in the illustration.

DeVilbiss representative Dick Mierers, who was on the job to see that everything was in order, went aloft with his camera and is shown enjoying the Flushing breeze.

Illustration showing the World's Fair Perisphere and workman who assisted with the spray finishing job.

Seventeenth Exposition of Chemical Industries

Announcement has just been made that the Seventeenth Exposition of Chemical Industries will be held this year at Grand Central Palace, New York City, during the week of December 4th to 9th. The Exposition this year is completing its 25th year of service to the chemical and allied industries. Since its inception in 1915, the Chemical Exposition has become the traditional means by which the industry's manufacturers and engineers convene to take inventory of material and equipment advances. This event has come to be recognized as a great contribution to continued progress of the chemical industries. The Seventeenth Exposition will be managed by the International Exposition Company under the personal direction of Charles F. Roth, president. Mr. Roth has been in charge during all the sixteen earlier appearances of the Chemical Exposition.

The first three floors of Grand Central Palace have been reserved for the

Seventeenth Exposition of Chemical Industries. Nearly 200 previous exhibitors have re-engaged the entire first and second floors and one-third of the third. Many of the exhibitors who were in the first Exposition in 1915 have already engaged space for 1939.

It has been said that nearly one-fourth of all American industry is chemical. In addition, the fact that the chemical industries are interrelated with all other forms of manufacturing gives the Chemical Exposition a direct relationship to many occupational groups. This accounts for the wide interest and the large attendance from many industries.

O. Hommel Co. Testimonial Luncheon

At a luncheon given by Mr. Oscar Hommel recently, forty-one employees of The O. Hommel Co., 209 Fourth Ave., Pittsburgh, Pa., aggregating 475 years of service with a minimum of five years each, were awarded service emblems by The O. Hommel Co. Mr. Hommel gave an inspiring discourse to the employees on this occasion.

Nicholson File Company Observes 75th Anniversary Year in 1939

In a special Anniversary message to industry and the trade this month, Paul C. Nicholson, vice-president of the Nicholson File Company, Providence, R. I., points out the significance of the seventy-fifth birthday of the famous file manufacturing concern.

"In our commemoration of the Nicholson File Company's Seventy-fifth Anniversary," Mr. Nicholson states, "we are of course observing the three-quarters of a century which has passed since the founding of the company. But of still greater significance to industry is the observance of another event that took place concurrently with the company's founding; the introduction, by William T. Nicholson, of a successful method of cutting quality files by machine."

The Founder's pioneering in quality production was sufficiently successful in the sixties and seventies, Mr. Nicholson states, so that only fourteen years after its founding, Nicholson File Company was supplying an annual volume double that of all file imports.

In order to maintain the high standards set by William T. Nicholson in 1864, and at the same time to keep pace with the rapidly-growing market that came with the machine age, the company expanded its activities to include four plants, at Providence, Philadelphia, Anderson, Ind., and Port Hope, Ont., much of whose equipment was built by the company itself. The company today manufactures genuine Nicholson, Black Diamond and McCaffrey

Paul C. Nicholson, vice-president, Nicholson File Company

Files and Rasps and Nicholson X.F. Swiss Pattern Files, as well as the commercial brands including American, Arcade, Eagle, Great Western, Kearney & Foot, McClellan and J. Barton Smith.

C. E. Herington Appointed Director of Publicity and Advertising Manager for Meehanite Research Institute

C. E. Herington has been appointed Director of Publicity and Advertising Manager by the Meehanite Research Institute of America, Pittsburgh, Pennsylvania. He will conduct an advertising and publicity program for Meehanite Metal.

Mr. Herington previously was connected with a Pittsburgh publicity organization serving leading industrial firms.

Harlan M. Gale Representative of Maas & Waldstein

According to a recent announcement, Maas & Waldstein Company, 438 Riverside Ave., Newark, N. J., announced the appointment of Mr. Harlan M. Gale as a sales representative for the New England territory.

Mr. Gale is well known in New England and has had wide experience in selling, servicing, and demonstrating finishing materials of all kinds.

Record Attendance Expected for Chicago Annual A. C. S. Meeting

To duplicate the outstanding success of the American Ceramic Society Meeting held in Chicago ten years ago, the various local committees in charge of affairs for the coming 41st Annual Meeting have been extremely active handling the many necessary details for an expected record attendance.

The first major activity for the meeting to be held at Chicago's Stevens Hotel, April 16th to 21st, will be the Orton Lecture scheduled for the Grand Ballroom on Sunday evening, April 16th, at 7:00 p. m.

A general session of the meeting has been scheduled for all day Monday, April 17th, in the North Ballroom. The session will convene between the hours of 9:00 a. m. and 5:00 p. m. Division sessions for Tuesday and Wednesday, between the hours of 9 to 5, will be held in the meeting rooms as indicated:

Art Division.....Room 430-A
Enamel .....South Ballroom
Glass .....North Ballroom
Material and Equipment....Room 412-A
Refractories.....North Assembly Room
Structural Clay,
Private Dining Room No. 2
White Wares.....West Ballroom
Terra Cotta..Private Dining Room No. 1

H. E. Ebright Now With Chicago Vitreous

Friends of Harry Ebright will be interested to learn of his addition to the staff of the Chicago Vitreous Enamel Products Company, 1423 S. 55th Court, Cicero, Ill. Mr. Ebright has been associated with the porcelain enameling industry for almost 20 years and has had a wide range of experience in connection with enamel manufacture and the operation of enameling plants.

He earned his degree in ceramic engineering at Ohio State University in 1922 and since that time has held sales, service and executive positions in the enameling industry. Mr. Ebright will assume his new duties in sales and service work for Chicago Vitreous effective immediately.

Elmer Ward Joins Quaker Chemical Products Corporation

Quaker Chemical Products Corporation, Conshohocken, Pa., has announced the appointment of Mr. Elmer Ward to the Technical Sales Division. Mr. Ward is an expert cutting oil technician, having been closely associated with their development and application for 25 years. He was previously associated with well-known manufacturing concerns as tool superintendent and later as general superintendent.

Mr. Ward will establish his headquarters in Dayton, Ohio, and will aid in servicing the trade in western Ohio and eastern Indiana.

Mention PRODUCTS FINISHING when writing to advertisers. Your co-operation will be appreciated both by the advertiser and this magazine.

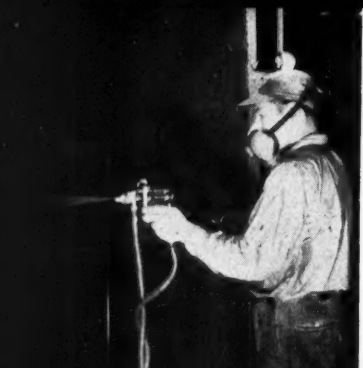
NEW AND IMPROVED
IN DESIGN AND COMFORT!

THE Dustfoe RESPIRATOR

U. S. Bureau of Mines-approved for protection against Type "A" dusts—lightweight—compact—with very low breathing resistance, foolproof Army-type exhalation valve, protective filter cover ... *these and many other outstanding features* make the comfortable new aluminum and rubber Dustfoe today's great value in dust protection! Write for complete details in Bulletin No. PF-CM-2.

1914 - - 25 YEARS OF SAFETY PROGRESS - - 1939

MINE SAFETY APPLIANCES COMPANY
Braddock, Thomas & Meade Sts., Pittsburgh, Pa.
District Representatives in Principal Cities



NEW Plant equipment and MATERIALS

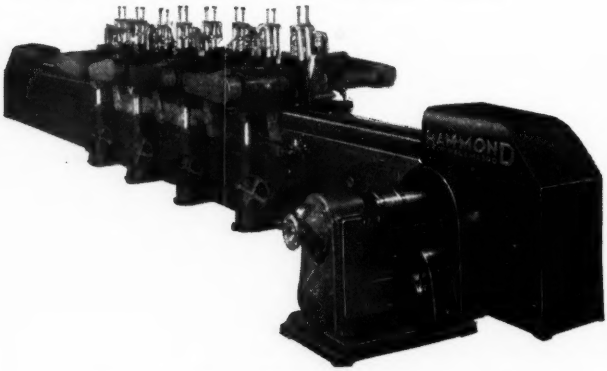
Hammond Model HBH-8 Strait Line Automatic Polishing Machine

Hammond Machinery Builders, Inc., 1622 Douglas Ave., Kalamazoo, Mich., recently placed on the market a Strait Line Automatic Polishing Machine which is equipped with automatic composition applicators to be known as the "Model HBH-8."

The Model HBH-8 has eight ball bearing floating heads and each one will accommodate A.C. motors up to 10 H.P. The table of the unit has 88 cast iron 8 x 10¼ in. platens mounted on four bearings which run on a steel track. The speed of the table can be varied from 14.5 ft. to 70 ft. per minute by means of a sturdily built variable speed reducing gear.

A very desirable feature of the Model HBH-8 is the "Auto Doper," which applies buffing composition automatically to the buffing wheels. The "Auto Doper" is adjustable so as to apply varying amounts of compositions and is built to handle rectangular bars of buffing composition from 2 in. square to 2 in. x 6 in. x 9 in. long. The "Auto Doper" is operated by means of compressed air through a three-way valve timed to the conveyor of the buffing machine.

The "Auto Doper" Buffing Composition Applicator is also made to accommodate 2-in. diameter bars which rotate after each application and thus prevent a narrow buffing wheel from cutting grooves in the bar and causing waste.



Hammond Model HBH-8 Strait Line Automatic Polishing Machine

Permite Ready-Mixed Aluminum Paint

A new principle in aluminum paint production has been announced by the Paint Division of Aluminum Industries, Inc., 2438 Beekman St., Cincinnati, Ohio. One group of paints is available for maintenance work and the other for production finishing.

In the maintenance group, Permite

Ready-Mixed Paints include a high heat resisting type with an exclusive synthetic alkyd resinous vehicle, which permits its use on iron and steel where temperatures range from 450 deg. F. up to 1,000 deg. F. In the maintenance group are also included Permite "Outdoor" Aluminum Paint, a long oil type for exterior applications; a wet surface type for application on wet, damp or moist surfaces; a quick drying type; a medium oil length type for machinery and equipment; a utility grade for interior appearance and illumination; and a general purpose maintenance type.

The production finishing classification includes a quick drying, ready-mixed aluminum paint that will dry to the touch in 10 to 15 minutes. This finish is applicable on toys, ornaments, and all kinds of metal products. The production finishing classification also includes a ready-mixed nitrocellulose spraying lacquer that will dry to touch in 5 to 10 minutes; a very fast drying spraying lacquer which will dry to touch in one-half to two minutes and dry hard in three to five minutes; a short oil synthetic grade of ready-mixed aluminum paint intended for use where a very smooth and brilliant finish is desired; and a dipping type which can be air dried or baked at 300 deg. F.

Both groups of Permite Aluminum Paint are ready-mixed and ready to use, and do not require mixing on the job.

Flexrock Floor Patching Material

Ruggedwear Resurfacer, manufactured by Flexrock Company, 2301 Manning St., Philadelphia, Pa., has undergone a second major improvement since

Illustration showing method of mending a bad spot in a floor with Ruggedwear Resurfacer.

DID YOU KNOW THAT—

—Buffing compositions are available for producing beautiful satin finishes? See page 8.

—A catalog is now available describing a process that holds paint to steel and resists rust? See page 17.

—Rejects are practically unknown when workpieces are finished in a completely air-conditioned spray department? See page 18.

—Voltage cannot be used as the indicator when plating to specifications? See page 24.

—You can get a larger share of business from the metal cleaning, plating, polishing and finishing industries through advertising in PRODUCTS FINISHING? See pages 42, 43.

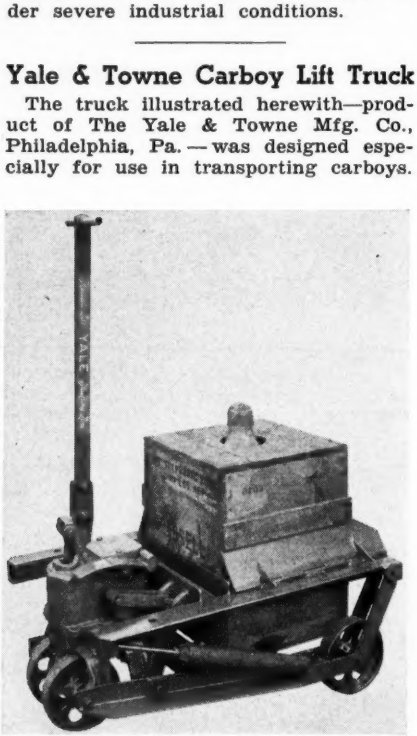
—Free information can be had on practically any subject dealing with the metal-finishing industry? See page 70.

it was placed on the market five years ago. This improvement consists in the addition of montmorillonite, which is chemically composed of manganese, silica, alumina, and iron.

The addition of montmorillonite in the process of Ruggedwear Resurfacer is also said to make it mix easier with cement, sand and stone and further increases the toughness of Ruggedwear and makes it ideal for "feather edge" concrete repairs. When used as a ½-in. topping over concrete, Ruggedwear Resurfacer is said to last indefinitely under severe industrial conditions.

Yale & Towne Carboy Lift Truck

The truck illustrated herewith—product of The Yale & Towne Mfg. Co., Philadelphia, Pa. — was designed especially for use in transporting carboys.



Yale & Towne Carboy Lift Truck

The lifting frame was designed to conveniently straddle the carboy while the wing attachments on top of the lifting frame permit adjustment to take care of small variations in carboy widths.

The 6-in. mechanical lift is obtained through a downward movement of the handle. The load may be raised from either side or from the front. An automotive type release check is installed in each lower side frame and the two checks, working together, lower the load smoothly and without jar. Hyatt roller bearing semi-steel wheels operating on alloy steel axles provide for easy, frictionless operation.

General Electric Thickness Gage

An electric thickness gage for measuring the thickness of non-magnetic coatings on iron and steel when these coatings are applied on curved as well as flat surfaces has been placed on the market by General Electric Company, Schenectady, N. Y. Measurements can be made of porcelain coatings, paints, lacquers, varnishes, and so on.

Two contact discs on the head of the gage ride the coated surface regardless of small irregularities or moderate curves. Individual readings of the two contacts are averaged automatically. Readings can be taken on coatings which are as thin as 0.001 in. if the coating is applied to a steel sheet of 0.007 in. or more in thickness. Accuracy of 2 per cent is maintained on coating thicknesses of 0.005 in. or more.

Beckman Automatic pH Instrument

The National Technical Laboratories, 3326 E. Colorado Blvd., Pasadena, Calif., manufacturers of Beckman pH control instruments, have recently announced a new type of pH instrument that is completely automatic in its operation. This instrument is shown in the accompanying illustration.

The Beckman Automatic pH Instru-

For a real good polishing job use
KEYSTONE EMERY
TURKISH — NAXOS — AMERICAN
KEYSTONE EMERY MILLS *Write for Sample* 4316 Paul St., Phila., Pa.

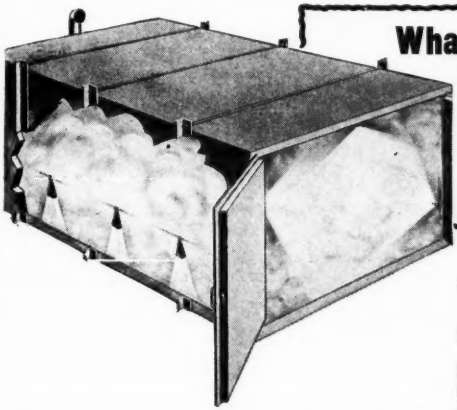
ment has been developed for use in all manufacturing operations where large scale pH control must be accurately maintained. The instrument incorporates a potentiometric circuit that is automatically maintained in null balance by a 110 volt a.c. operated electronic amplifier. The device can be plugged into any standard light circuit and fluctuations in line voltage are automatically compensated for.

The Beckman Automatic pH Instrument makes use of glass electrodes which are permanently sealed, internally shielded and unusually rugged. These instruments may be installed on grounded flow lines, tanks, vessels or practically anywhere in the plant without danger of stray current effect. This is said to be a valuable feature inasmuch as it means that continuous control can be maintained over flowing solutions without the need of sampling devices.

An important feature is the provision that is made for connecting additional indicating meters at any distance from the instrument, and for connecting a controller mechanism and also any standard recording potentiometer. Thus, in addition to providing continuous pH indication on a 6-in. direct-reading scale which is part of the meter, the instrument itself is a complete and separate

Beckman Automatic pH Instrument

unit for continuous pH indication. The recorder and controller units can be instantly connected to it without special calibration or special accessories of any



What are you doing about FIRE PROTECTION for Baking and Drying Ovens?

TAKE newly painted materials. Expose them to the intense heat of an oven. And you have the makings of a first-class fire hazard.

Electrical shorts, the ignition of drippings on hot floors, flash fires from fumes in overheated ovens . . . these cause the blazes that bring production to a full stop!

Your solution? — A LUX Built-In Extinguishing System . . . *automatic* fire control that floods the oven with a fire-killing blizzard of Lux carbon dioxide snow-and-gas, fastest known extinguishing agent. Yet it harms nothing but fire. No mess, no damage to finished parts. Write today. Use the coupon.

Walter Kidde & Company
431 West Street, Bloomfield, N. J.

LUX SNUFFS OUT FIRE

Please send me information on LUX Fixed Systems for oven protection.

Name .....

Company .....

Address .....

kind being required.

Still another important feature of this instrument is the automatic temperature compensator which, by means of a resistance thermometer incorporated in the electrode assembly, automatically adjusts the instrument to any changes in the temperature of a test solution. This is said to assure constant accuracy over a wide variety of operating conditions.

A locking device is provided which securely locks the control panel against unauthorized tampering. This permits the instrument to be set for controlling critical manufacturing processes and eliminates the danger of having the setting changed without proper authorization.

The Beckman Automatic pH Instrument is available in standard scale ranges of 0 to 7 pH, 3 to 10 pH, or 6 to 13 pH in 0.1 divisions and in other scales and ranges on special order.

Koilstrip Heating Element

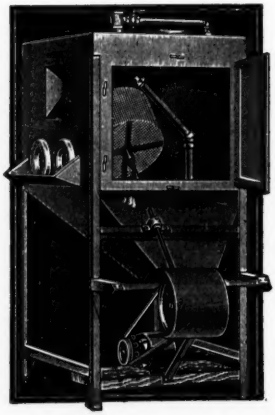
A four-blade heating element assembly for immersion application, to be known as "Koilstrip," has been placed on the market by Edwin L. Wiegand Co., 7507 Thomas Blvd., Pittsburgh, Pa. The four circular blades of the Koilstrip unit have a total rating of 6 kw. and are assembled on a double riser and terminal box.

The Koilstrip assembly is designed to pass through a 15-inch opening in a tank. This unit is said to have a capacity to maintain a solution into which it is immersed at 350 deg. F.

Below the elements of the Koilstrip units are legs to keep them above the level of the tank and to assist in the circulation of the solution. The double riser makes it possible to connect to only two of the four elements when the tank is partially filled with the material being heated. The heating elements themselves are available sheathed in copper, Everdur, Monel metal, or stainless steel. The unit can be supplied for water heating with a copper sheath and rating up to 12 kw. The riser height and controls are subject to specification for a given application.

Leiman Bros. Continuous Feed Sand Blast

To simplify the task of sand blasting small parts, Leiman Bros., Inc., 4W-23 Walker St., New York, N. Y., are now manufacturing the continuous feed sand blast machine shown in the illustration.



Leiman Bros. Continuous Feed Sand Blast

The machine is of the cabinet type and is so designed that the feed of the sand is controlled by the operator's foot. Pressure on the foot lever causes the abrasive to be fed into the machine, the supply of air and abrasive being shut off when the lever is released. Large nozzles are used which sand blast an extensive surface at the low pressure of approximately 5 lbs., but the pressure may be varied by the operation of the lever.

The abrasive strikes the work, then falls to the bottom of the machine and is drawn up through the pipe again by suction, in this way being used over and over again continuously. The operator may stand in front of the machine and work in comfort, all dust being confined within the cabinet. To operate, the operator inserts his two hands

Oriental Rouge is the ideal rouge for obtaining a mirror-like finish on stainless steel, silver, gold and all other metals. Write for details.

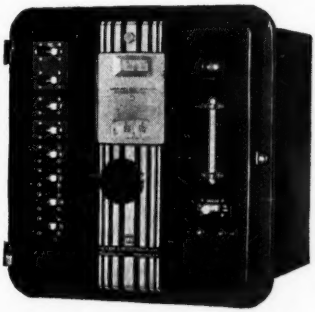
Oriental Rouge Co., Inc.
Established 1901
66 Pine St. • Bridgeport, Conn.

through the arm hole cuffs and places or holds the work under the nozzle, then steps on the foot lever and watches the progress of the work through the glass in the front of the machine. The piping system employed in the construction of these machines consists of standard iron pipe and fittings which are easily replaced when necessary.

L & N Temperature Indicator

Ample space for toggle-type switches, for connecting any one of a number of couples to the measuring circuit, is provided in a new temperature indicator made by the Leeds and Northrup Company, 4934 Stenton Ave., Philadelphia, Pa. Installed wherever convenient, it enables an operator to measure temperatures of near or distant couples with equal reliability, by simply turning a knob, until a pointer comes to zero, and reading a temperature scale.

Use of a potentiometer measuring



L & N Temperature Indicator

circuit . . . hand-standardized, but with automatic reference-junction compensation . . . eliminates uncertainties due to circuit-resistance variables. Scale is practically uniform and equally accurate throughout, and can be calibrated for single or double range, the latter for use with similar or different couples. Built-in terminals, check key and mercury thermometer can be included for checking with a portable indicator.

The rigid metal case mounts flush in panel, but can be equipped with hangers for surface mounting. The galvanometer is a sturdy replaceable unit. The only maintenance is occasional dry cell replacement. Warning that dry cell must be renewed is given when a red disc appears above the indicator scale.

Separate selector switches can be used external to the indicator, if desired, or space for additional self-contained toggle-type switches may be obtained by assembling the indicator (with case removed) in a cabinet similar to that of the Micromax stripchart recorder.

U. S. R. Conveyor Belting

An improved conveyor belt construction, embodying a feature designed to withstand unusually severe service conditions, has been announced by United States Rubber Co., Mechanical Goods Div., 1790 Broadway, New York, N. Y.

The refinement, engineers explain, is accomplished by imbedding a special weave breaker-strip fabric in a heavy layer of soft white gum. This layer is inserted next to the belt carcass as an integral part of the belt cover, and provides a shock absorbing cushion for the belt cover.

Because of its ability to absorb the shock of heavy impact this new type of construction increases the effectiveness of the cover in resisting the gouging,

R-700

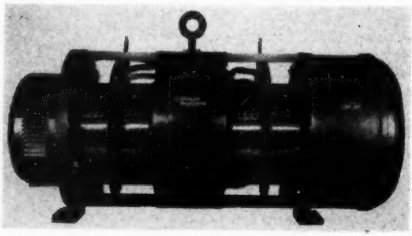
An unusual Rust Inhibitive.
Dries with lacquer speed.
Very flexible baking schedule.
Resists salt spray remarkably.
Very light in color.
Ideal vehicle for bronze powders and pastes.
Suggested wherever RUST is a production problem.
Remarkably adherent as primer under baked finishes.
Variations for special requirements available.
Our pamphlet will be gladly sent on request.

The Varnish Products Co.
5208 HARVARD AVENUE
CLEVELAND, OHIO

snagging and other severe wear encountered in heavy service. In addition to the increased cover wear thus obtained, its designers point out, extra protection is provided for the belt carcass due to the ability of this white breaker-insert to withstand and cushion the blows of heavy material.

Hobart Heavy Duty Production Plating Generator

A 3,000 ampere motor generator which is said to be built especially for heavy duty production plating has been placed



Hobart Heavy Duty Production Plating Generator

on the market by Hobart Bros. Co., Troy, Ohio.

The Hobart Heavy Duty Production Generator is a complete Hobart built outfit. The high efficiency of both the Hobart motor and generator, coupled with liberal design, is said to give ample capacity to handle peak loads easily as well as light loads economically.

The Hobart Heavy Duty Production Plating Generator may be used for retinning, rustproofing, hard chromium plating of tools, electroetching, electrotyping, electropickling and cleaning. The unit is designed to furnish current for the plating of most metals, including nickel, brass, bronze, copper, silver, gold, zinc, cadmium, chromium, tin and lead.

Skilsaw Airmaster

A portable electric 2-speed blower, to be known as the "Airmaster," has been placed on the market by Skilsaw, Inc., 4743 Winnemac Ave., Chicago, Ill. This blower is a 2-speed unit that is said to combine the utility of both a high speed and a low speed blower in one all-purpose tool.

The 2-speed feature of the Skilsaw Airmaster is especially adaptable for cleaning jobs that require a variation of blower power. The air output of the Skilsaw Airmaster extends the applica-

Skilsaw Airmaster

tion of a portable blower to many uses which previously could not be taken care of by a portable unit.

The 2-speed feature also gives the Skilsaw Airmaster additional safety. This unit develops a velocity of 20,500 and 26,000 lineal ft. per minute with a capacity of both 125 and 176½ cu. ft. per minute. The Airmaster is designed so that it can be used with standard attachments as a suction cleaner or sprayer.

RUST-I-CIDE "50"
Cleans, etches, and prepares metal for a perfect finishing job.
It can help your product.
RUSTICIDE PRODUCTS CO.
3125 Perkins Ave. • Cleveland, Ohio

Borolon TRADE MARK ABRASIVE POLISHING GRAIN
Strictly first quality aluminum oxide abrasive grain manufactured in our own electric furnace plant. Specially prepared and treated for most efficient polishing performance. Write for samples.
ABRASIVE COMPANY (GRINDING WHEEL AND ABRASIVE DIVISION OF SIMONDS SAW AND STEEL CO.) PHILADELPHIA, PA.

Sprayit Streamline Spray Gun

A spray gun which is said to be streamlined both in appearance and operation, to be known as the "Sprayit STR Streamline Spray Gun," has been

Sprayit Streamline Spray Gun

placed on the market by The Electric Sprayit Company, 220 N. Broadway, Milwaukee, Wis. The STR Model Gun is said to be instantly convertible from a bleeder to a non-bleeder type and can also be used on air lines as well as portable compressors.

The Sprayit STR Streamline Spray Gun is regularly furnished in two styles — either as a pressure feed spray gun with round, fan and angle spray internal mix spray nozzles, or as a siphon feed gun with an external breakup nozzle that is said to provide both fan and round spray patterns from the fan nozzle. Both styles of guns have the feature of converting instantly from bleeder to non-bleeder types, thus making them equally suitable for use on both portable compressors and air lines.

The entire spray gun body and removable cover are made of die cast aluminum and the one-quart capacity finishing material container is also aluminum. This gun is exceptionally light in weight and is very comfortably shaped in true revolver grip fashion which is said to permit great ease in handling and also tireless operation. The gun may be used with pressure paint tanks as well as with the quart container simply by removing the container and cover.

Another important feature of the Sprayit STR Streamline Spray Gun is a self-contained oil and moisture filter which is built integrally into the handle of the gun. This method removes the last vestige of oil and moisture from the air and thus protects the finish from defects caused by contamination of the air. The filter is equipped with a drain valve at the bottom of the handle through which the accumulated air and moisture may be drained off periodically.

All working parts of the Sprayit STR Spray Gun are enclosed, thus eliminat-

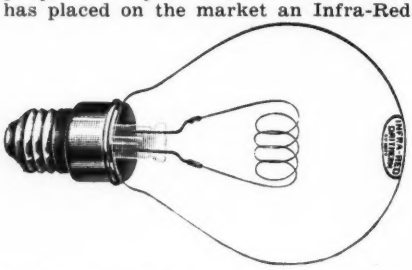
METALPREP
"Used First — Makes Your Paint Finish Last"
• INSURES PERFECT BOND BETWEEN METAL & PAINT.
• MAKES THE METAL SAFE FOR PAINT.
Ideal for preparing Iron, Steel, Aluminum, Aluminum Alloys, Galvaneal, Galvanized Iron, etc., for paint finishes. Has been used on more than ten million units.
Write for Literature Today
NEILSON CHEMICAL CO.
6564 BENSON ST. DETROIT, MICH.

"INDIAN BRAND" TURKISH EMERY
"INDIAN BRAND" TURKISH AND NAXOS EMERY
"HECCO BRAND" AMERICAN EMERY
. . . cuts cleaner, faster and longer because it's made only from select grades of ore — accurately graded and thoroughly cleaned. *Prompt shipments on any quantity.*
WRITE FOR TRIAL LOT.
HAMILTON INDIAN BRAND
EMERY & CORUNDUM CO.
CHESTER • MASS.

ing the possibility of clogging of parts with paint. All controls are located at the back of the gun. All air nozzles and fluid tips furnished with the gun are made of case-hardened steel.
made of case-hardened steel.

Dritherm Infra-Red Ray Lamps for Radiant Drying and Heating

North American Electric Lamp Company, 1014 Tyler St., St. Louis, Mo., has placed on the market an Infra-Red Ray Lamp for radiant drying and heating to be known as "Dritherm." Dritherm Lamps have been manufactured especially for radiant drying and heating purposes and represent the final development of over four years of practical application in a number of the country's largest plants, including automobile plants where they are used for paint baking.



Dritherm Infra-Red Ray Lamps for Radiant Drying and Heating

Long burning life in proportion to high efficiencies obtained, uniformity of filament materials, as well as placement of carbon filament within the bulb, and rugged construction to minimize breakage are several features claimed for these lamps.

Preparite Cleaning Material

A non-abrasive, clear liquid material compounded for wiping onto a glossy, enameled surface prior to refinishing, to be known as "Preparite," has been placed on the market by Sherwin-Williams Co., 101 Prospect Ave. N. W., Cleveland, Ohio. The application of Preparite to the surface is said to act as a substitute for washing and sanding in order to clean the surface and prepare it for the refinishing work.

A slight tack is created temporarily on the old surface to which the new finish can bond without crawling or pulling away when Preparite is used. The old finish is said to be smooth without creating dust and without scratching. Wax, grease and polish are removed from the old surface.

Application of Preparite is made by wiping an old surface with a cloth dampened with the material or the new finish can be thinned by mixing four ounces of Preparite to each gallon of the finish.

Anderson Pipe-Line Strainer

A pipe-line strainer for use in pipeline installations from ¼ in. to 2 in. has been placed on the market by V. D.

LIONITE
POLISHING GRAINS

1. CBT LIONITE
An etched grain built to withstand the shock and stress of rough work. Sizes 10-90 incl.

2. EPT LIONITE
An etched grain designed to prevent glazing. For operation where little self-dressing of the wheel occurs. Sizes 24-90 incl.

3. ST LIONITE
A finishing grain. Chemically treated to facilitate "greasing." Sizes 100-240 incl.

THE
General Abrasive Co.
NIAGARA FALLS, N. Y.

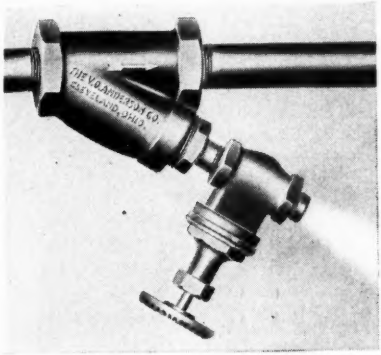
METAL CYANIDES
(Copper, Zinc and Silver)
Save time and labor in making the plating bath. Let us serve you.

COOPER'S CERTIFIED CHEMICALS

Chas. Cooper & Co.
186 Worth St. New York, N. Y.

Anderson Co., 1929 West 96th St., Cleveland, Ohio. The Anderson strainer has a cast iron body, screen-locating plug and stainless steel cylindrical screen.

The Anderson strainer is suitable for



Anderson strainer for pipe-line installation enclosed in Y connection

removing solid foreign matter from gases or liquids on pressures to 250 lbs. at 450 deg. F. These strainers can be employed on pressures to 300 lbs. where the temperature does not exceed 250 degrees Fahrenheit.

The strainers range in size from ¼ in. to 2½ in. and with overall length of 3¼ in. to 7¾ in. An outlet opening from the inside of the strainer element can be fitted with a valve rather than a plug so this opening can be vented from time to time in order to clean out the strainer.

Northern Hydraulic Dipping Machine

A hydraulic dipping machine for use with a paint tank has been placed on the market by Northern Machine Manufacturing Co., 630 Washington Ave., Wausau, Wis. The machine is designed to apply finishes in connection with a paint tank located on an elevating table. The latter fits into a recess in the machine table and permits raising and lowering the paint tank to paint pieces of work measuring approximately 1 to 24 in. in length.

The Northern Hydraulic Dipping Machine is available for floor mounting on three casters for portable use in connection with tanks set either on the floor or in a recess beneath it. In the latter case, work length capacity is 6 feet. Parts to be dipped are suspended from a rack that is located in a holder between two vertical uprights. The holder is attached by cables, which pass over sheaves, to a motor-driven hydraulic mechanism mounted at the rear. The mechanism can be operated at hoisting and lowering speed from 1 in. in 2 minutes to 36 in. per minute.

The bench-mounted type machine is 16 x 32 x 32 in. in size. The Northern

Lupomatic

Here is a *completely automatic* process for finishing all metals to a high grade lustre *at a saving of from* 60% *to* 92%.

Let us demonstrate *this money saving process to you gratis.*

Lupomatic Tumbling Mach. Co., Inc.
4511 Bullard Ave. New York, N. Y.

MAGIC TACK RAGS remove specks, lint and sand particles--- bring out that deep, smooth luster, produce a faultless surface for white or colored finish. Why use "home made" tack rags when you can buy MAGIC TACK RAGS at trifling cost! They are tackier, do not dry--- are dust-proof and spontaneous combustion proof. Packed in dozen and gross lots or more. Made only by the

Wm. A. Juergens Co.
4036-40 Lagrange Street,
Toledo, Ohio, U. S. A.
If your dealer does not carry Magic Tack Rags, write us for sample.

Hydraulic Dipping Machine is available in sizes to meet the specific requirements of the customer.

Maas & Waldstein Polydur Enamel

A synthetic enamel which requires a very short baking schedule, to be known as "Polydur," has been placed on the market by Maas & Waldstein Company, 438 Riverside Ave., Newark, N. J. This type of finish has been developed to enable manufacturers to speed up production by reducing the time required for finishing their products.

Polydur enamels are said to set out of dust in a few minutes. The baking schedule depends upon the temperature employed. One recommended baking schedule for a fine finish without discoloration is 325 deg. F. for 15 minutes. The finish obtained is said to be very durable and resistant to marring, moisture, and ordinary household chemicals. Polydur finishes are supplied in white and all colors, for spraying or dipping.

Ronci "Speedip" Whirl Enameler

A combination dipping-whirling machine for completely coating large quantities of small parts with lacquer, enamel, paint or any other liquid finishing material, to be known as the "Speedip" Whirl Enameler, has been placed on the market by F. Ronci Co., 45 River Ave., Providence, R. I.

Ronci "Speedip" Whirl Enameler

The main housing of the Speedip is constructed of steel and the work basket, which is steel wire mesh, is 11½ in. in diameter. The base, top, tank lever, and so on are made of cast iron. The unit can be controlled by a single lever. The motor and switch are both explosion proof and reversible.

To operate the machine, the work basket is filled with parts to be coated and placed inside the machine. Directly under the basket there is a tank that can be raised and lowered in three positions by means of a lever which is located on the inside of the machine. When the lever is push up, it raises the tank in which the finishing material is located and thus the work basket is immersed in the coating material. The lever is then pushed downward to a neutral position, which brings the basket out of the coating material but still below the top edge of the tank. The machine is then started, causing the basket to whirl, throwing off the excess material so it will drain back into the tank. When the lever is pushed into the low position, the basket is returned to the starting position. At this point, the basket can be easily removed from the machine with the coated parts.

1-Second Metal Cleaner

A metal cleaner that is said to completely remove stains and oxides from copper, brass, bronze and other metals, except aluminum, iron and zinc, to be known as "1-Second," has been placed

Check in ✓ DeWITT OPERATED HOTELS

In CLEVELAND it's
√ The HOLLENDEN

In COLUMBUS it's
√ The NEIL HOUSE

In AKRON it's
√ The MAYFLOWER

In JAMESTOWN, N. Y., it's
√ The Jamestown and
√ The SAMUELS

THEO DEWITT, *Pres.* R. F. MARSH, *V. P.*

on the market by Rapid Electroplating Process, Inc., 1414 S. Wabash Ave., Chicago, Ill. This cleaning material is said to contain no abrasives of any kind.

1-Second Metal Cleaner cleans by

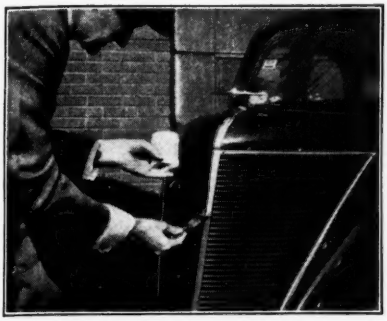


Illustration showing the method of applying 1-Second Metal Cleaner

chemical action only and requires no rubbing. It has a jelly-like consistency and can be applied with a brush and then immediately wiped off with a wet rag and then dried. This cleaner does not contain any free acid or caustic and will not etch or harm the metal surface in any way even if permitted to dry on the surface.

1-Second Metal Cleaner retards the forming of oxide and since it contains no abrasive, makes it useful for rendering working surfaces chemically clean without leaving any gritty residue. Inaccessible crevices are easily cleaned according to a statement made by the manufacturers.

Valdura No-Rust Paint Primer

A paint primer, to be known as "No-Rust," for use in forming an air-tight film over rusted metal has been placed on the market by American Asphalt Paint Co., 41 E. Ohio St., Chicago, Ill. This finish has been developed primarily for painting rusted metal surfaces where cleaning time or expense is not warranted.

Valdura No-Rust Paint Primer serves as a priming coat for additional finishing coats to complete a paint job. It is also said to aid in preventing corrosion action.

Nielco Rust-Solv

Nielco Products Co., 5405 Cicotte Ave., Detroit, Mich., has placed on the market a rust solvent in semi-paste for use on metal surfaces, to be known as "Rust-Solv." This material is available in four formulas which are said to include two strengths and two types. One of the types can be removed with water and the other requires an alcohol solution. Application of Rust-Solv can be made in a manner similar to brush painting. One gallon will cover approximately 700 sq. ft. of surface.

Mention PRODUCTS FINISHING when writing to advertisers. Your co-operation will be appreciated both by the advertiser and this magazine.

FOR SALE

Guaranteed DeVilbiss Reconditioned Guns —Booths—Fans—Transformers. DeVilbiss Distributors.

Hovey Spray Equipment Co.

1509 Spring Garden St., Philadelphia, Pa.

IN PHILADELPHIA IT'S THE

HOTEL PHILADELPHIAN

39th and Chestnut Streets
Philadelphia, Pa.

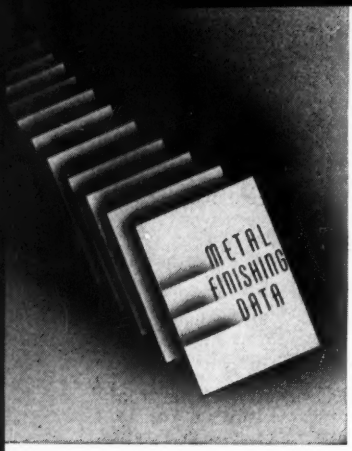
Conveniently located to all Stations, and only five minutes from the heart of the business section.

★

600 ROOMS
600 BATHS

★

Room with Bath from $2.75 up



for your CATALOG library

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. Ideal Speed Lathes
A 16-page catalog describing Ideal Speed Lathes designed especially for finishing and polishing is now being issued by Schauer Machine Co., 2060 Reading Rd., Cincinnati, Ohio.

2. Aluminum Oxide Abrasive Grain
A 4-page catalog describing "Borolon," an aluminum oxide abrasive grain for the polishing trade and general industrial use. Abrasive Company, Tacony and Fraley Sts., Philadelphia, Pa. See page 64.

3. Continuous Feed Sand Blast Equipment
This catalog tells how a uniform surface finish can be obtained by the sand blast method. Leiman Bros., Inc., 4W-23 Walker St., New York City.

4. Protection Against Corrosion and Abrasion
Plastic and liquid rubber compounds which are said to provide positive protection against corrosion and abrasion are described in this 14-page catalog now being issued by Self-Vulcanizing Rubber Company, 605 W. Washington Blvd., Chicago, Ill.

5. Patterson Unipower Agitator
A folder describing the new streamlined Unipower which is said to meet every agitating requirement. The Patterson Foundry and Machine Company, East Liverpool, Ohio.

6. Pemco Micronized Clay
The newest development of The Porcelain Enamel & Manufacturing Company, Eastern and Pemco Aves., Baltimore, Md., known as "Pemco Micronized Clay," is described in this folder.

7. Corrosion-Proof Laboratory Equipment
The bulletin designated as No. 503 in which acid-proof chemical stoneware is illustrated and described is being issued by The U. S. Stoneware Co., Akron, O.

8 A Positive Prevention of Corrosion
A 4-page folder describing the adaptability of "Ne-Ver-Rust," a rust preventative that requires no preheating, is now being issued by The Never Rust Manufacturing Co., 103 Lafayette St., New York, N. Y.

9. New Wrinkles
A 12-page catalog published by New Wrinkle, Inc., Mutual Home Bldg., Dayton, Ohio, describing in detail the various types of wrinkle finishes available for product finishing. See page 29.

10. Metal Preparation Before Finishing
A folder describing the practical use of Rusticide "50" in preparing metal surfaces before paint. Rusticide Products Co., 3125 Perkins Ave., Cleveland, Ohio. See page 64.

11. Protective and Decorative Finishes
Hilo Varnish Corporation, 42-60 Stewart Ave., Brooklyn, N. Y., presents Bulletin No. 15 titled, "The Five Hilo Rip-pls."

12. Speedip Whirl Enameler
A 4-page bulletin describing a combination dipping-whirling machine for completely coating large quantities of parts with lacquer, enamel, paint or any other liquid finishing material. Ronci Machine Co., 45 River Ave., Providence, R. I. See page 39.

13. Airway Ventilated Buffs
Cool cutting buffs for high speed buffing operations are illustrated and described in a 4-page folder now being distributed by Jackson Buff Corporation, 21-03 41st Ave., Long Island City, New York.

14. Nickelite
A 4-page folder describing Nickelite, an addition agent for nickel barrel plating solutions. Platers Research Company, 59 E. Fourth St., New York, N. Y.

15. Rust-Proofing Methods
New books describing the Parker Processes are available to manufacturers and technical men. For more than 22 years the Parker Rust-Proof Company, 2172 E. Milwaukee Ave., Detroit, Mich., has devoted its entire time to rust-proofing methods. See page 17.

16. Alkali Cleaning Compounds
A new bulletin has been released by Detroit Rex Products Co., 13017 Hillview Ave., Detroit, Mich., describing Triad Alkali Cleaning Compounds. See fourth cover.

17. Metal Cleaning Hints
An interesting bulletin giving details on Metalprep Rust and Grease Remover. Tells how Metalprep makes metals safe for paint. Neilson Chemical Co., 6564 Benson St., Detroit, Mich. See page 65.

18. Bonderizing
The Parker Process that holds paint to steel and resists rust, known as "Bonderizing," is described in this catalog now being issued by Parker Rust-Proof Company, 2172 E. Milwaukee Ave., Detroit, Michigan.

19. Industrial Ovens
Two new bulletins giving full particulars on air heaters and industrial ovens. J. O. Ross Engineering Corporation, 350 Madison Ave., New York, N. Y.

20. Spray Booths and Ovens
Newcomb - David Company, Inc., 5741 Russell St., Detroit, Mich., has issued a 24-page catalog illustrating and describing typical N-D Spray Booths, Industrial Ovens, Metal Booths, Washers and Ventilating Equipment.

21. Spray Painting and Finishing Equipment
A most complete catalog describing and illustrating spray painting and finishing equipment manufactured by Binks Manufacturing Company, 3114-40 Carroll Ave., Chicago, Illinois.

22. Satin-Black Friction Reducing Finish
A 4-page folder describing Pentrate, a penetrating process which provides a means of applying an attractive, low-cost, friction reducing, black finish to steel through chemical action. Heatbath Corporation, Springfield, Mass. See page 35.

Print plainly in filling out coupon for literature.

PRODUCTS FINISHING
431 Main St., Cincinnati, Ohio

I am interested in receiving the following literature reviewed in your April issue.

No...... **No.**..... **No.**..... **No.**..... **No.**.....
(Insert numbers denoting literature you want.)

Name ..... Title.....

Company .....

Company Address .....

City..... State.....

INDEX *to advertisements*

Abrasive Company 64
Abrasive Products, Inc 13
Advance Paint Co. 32, 33
American Air Filter Co., Inc 27
American Chemical Paint Co. 53
Binks Manufacturing Company 36, 37
Cooper & Co. Inc. of New Jersey, Charles 66
Detroit Rex Products Co. ..... Fourth Cover
DeWitt Hotels, Inc. 68
Egyptian Lacquer Mfg. Co. 6
General Abrasive Company, Inc. 66
Hamilton Emery & Corundum Co., The 65
Haynes Laboratories Inc., C. W. 31
Heatbath Corporation 35
Hovey Spray Equipment Co. 69
International Nickel Company, Inc., The 4
Jarvis Company, The Charles L. 49
Juergens Co., Wm. A. 67
Keystone Emery Mills 60
Kidde & Company, Inc., Walter 61
Kirk & Blum Mfg. Co., The 25
Lupomatic Tumbling Machine Co. 67
MacDermid Inc. 23
Mahon Company, The R. C. ..... Third Cover
Michigan Chrome Company 15
Mine Safety Appliances Co. 57
Neilson Chemical Co. 65
North American Electric Lamp Co. 45
Norton Company 29
Oakite Products, Inc. 1
Oriental Rouge Co., Inc. 62
Packer Machine Co., The 19
Parker Rust Proof Company 17
Pennsylvania Salt Manufacturing Co 3
Philadelphia Quartz Company 52
Philadelphian Hotel 69
Pulmosan Safety Equipment Corp. 51
Ronci Machine Co. 39
Roxalin Flexible Lacquer Co. Inc. ..... Second Cover
Rusticide Products Co. 64
Stanley Chemical Co., The 11
Varnish Products Co., The 63
Watson-Standard Co., The 2

PRODUCTS FINISHING
PUBLISHED BY GARDNER PUBLICATIONS, INC.
431 MAIN STREET • CINCINNATI • OHIO